

NREL's Renewable Energy Finance Tracking Initiative (REFTI)



1H 2011 Summary

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Analysis Center*

September 29th, 2011

Housekeeping

Presentation, webinar recording, and aggregated spreadsheet data will be made available at NREL's RE Finance website:

<http://financere.nrel.gov/refti>

Agenda

- Revised REFTI process
- 1H 2011 Questionnaire Results (Jan – Jun 2011)
 - Will generally follow REFTI questionnaire progression
 - Technology Breakout
 - Wind, PV < 1MW, PV ≥ 1MW, CSP, Solar Thermal, Geothermal, Biomass – Elec, Biomass - Non-elec, Hydro, Other & Unspecified
 - Aggregate results from Q4 '09 – 1H '11
 - Trend analysis across multiple quarters
- Tour of the Dataset
- Question & Answer
 - Submit anytime during presentation, via internet conference
 - We will respond at the end

Data Confidentiality

- Ensuring respondent confidentiality is critical to NREL
- Data gathered through REFTI will only be utilized for:
 - *Providing aggregate values for model inputs*
 - *Reporting trends*
 - *Participant-specific data will not be utilized or distributed in any way*
- Non-disclosure agreements are available
 - *Executing an NDA is fully voluntary*
 - *3 – 12 month NDAs are available*
- Please let us know if you have any concerns over data provided through this webinar
 - *Any concerns will be addresses prior to releasing slides to public*

About the Data

- 1H'11 total respondents for *Primary Questions* (#'s 3 – 7) were 28:
 - 2 Wind, 5 PV<1MW, 8 PV>=1MW, 1 CSP, 1 Solar Thermal (non-elec), 5 Biomass – Elec, 5 Hydro, and 1 Unspecified
- Total respondents for *Secondary Questions* (#8 – 11) were between 28 - 53
- Data was not validated by NREL
- Unless specified in graphs, bin range mid-points were used to calculate weighted averages by technology
- Potential concerns:
 - Duplicate data
 - Misunderstanding questionnaire
 - Small sample size

Revised Spreadsheet Format

Characteristics of Survey Respondents

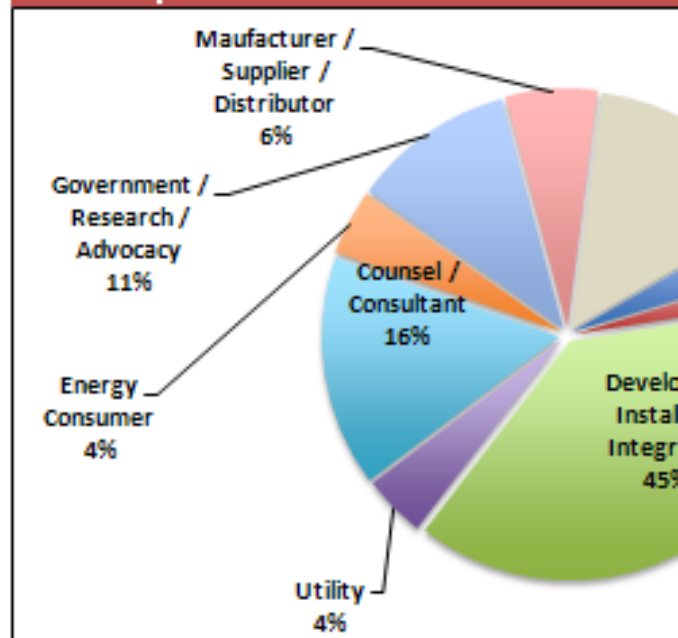
Composition of firms responding to this survey

Firm Composition

| Answer Options | Response Count | Response Percent |
|---------------------------------------|----------------|------------------|
| Equity Financier | 28 | 3.6% |
| Debt Financier | 17 | 2.2% |
| Developer/Installer/Integrator | 293 | 38.0% |
| Utility | 33 | 4.3% |
| Counsel / Consultant | 121 | 15.7% |
| Energy Consumer | 34 | 4.4% |
| Government / Research / Advocacy | 85 | 11.0% |
| Manufacturer / Supplier / Distributor | 48 | 6.2% |
| Other | 113 | 14.6% |
| answered question | 772 | |
| skipped question | 0 | |

Historical Data

Firm Composition



Revised REFTI process

- Semi-annual rather than quarterly
- Shorter questionnaire
 - Emphasizing project financing terms, deal structure, government incentives and barriers to development
- Question Reordering
 - Primary - Limited to projects that closed financing during questionnaire time period
 - Secondary – Open to all participants
- Survey feedback

Table of Contents

- Characteristics of Survey Respondents
- Project Information (that closed financing)
 - Financial Structure, Project-level Debt & Equity
 - Power Purchase Agreement (PPA) Structure
- Barriers and incentives
 - Governmental Incentive Programs
 - Barriers to Project Development
- Bonus question

REFTI Questionnaire: Q1

* 1. Primary renewable energy development business.

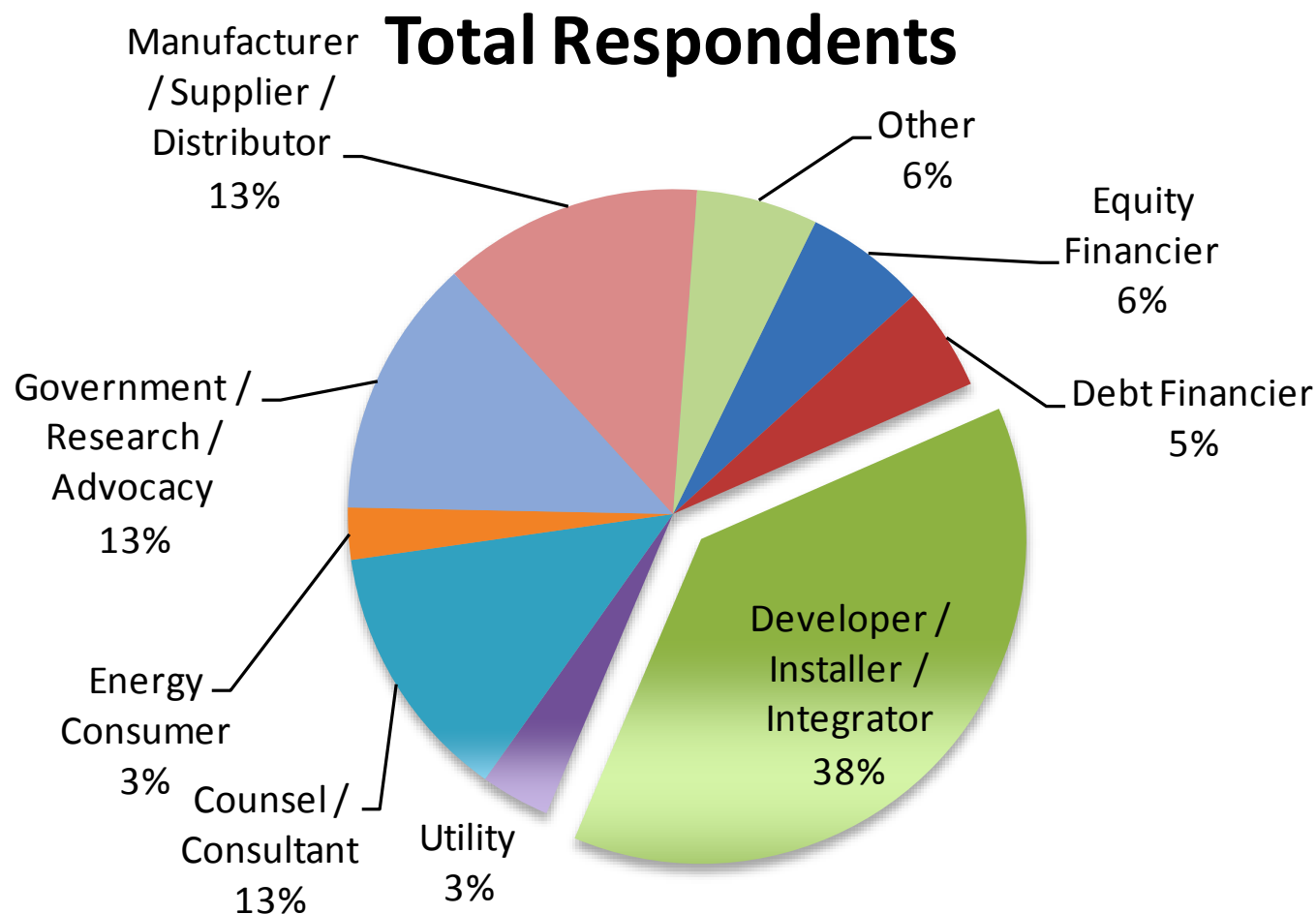
Project Development Role

Primary Technology

What best describes
your role and primary
technology being
developed?

Comment on project development role or technology

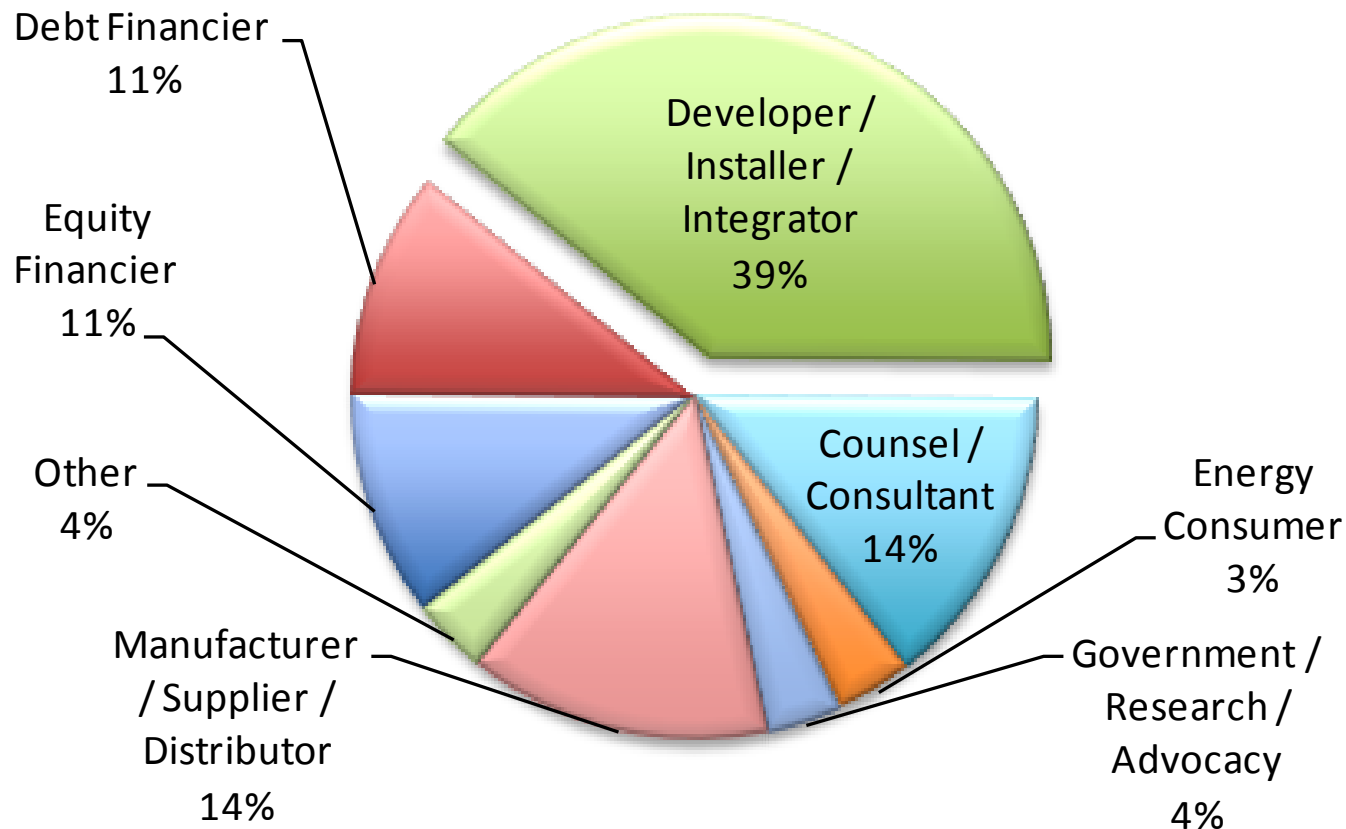
Participation: 1H'11 Firm Composition



116 people entered the questionnaire; Developer / Installer / Integrator represented largest segment with 38%

Participation: 1H'11 Firm Composition

Primary Question Respondents



28 respondents left detailed financial information on RE project finance, providing the most insight into project terms

REFTI Questionnaire: Q3

*** 3. Please describe your current project(s).**

of Projects that Closed
Financing

MWs Financed

Primary Financial Structure

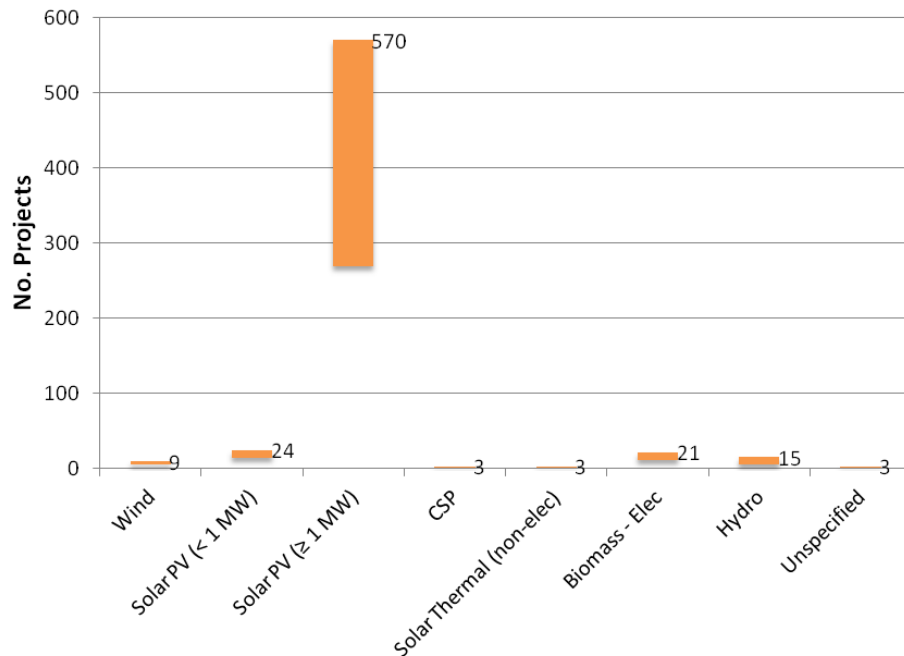
Primary Technology



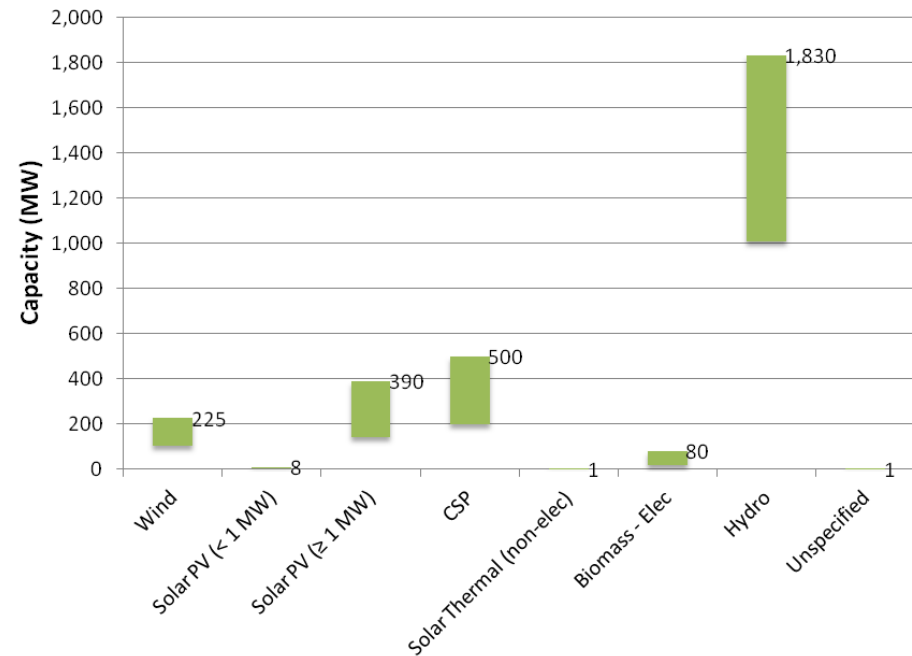
Other Financial Structure (please specify)

Current Projects 1H'11

No. of Projects Financially Closed



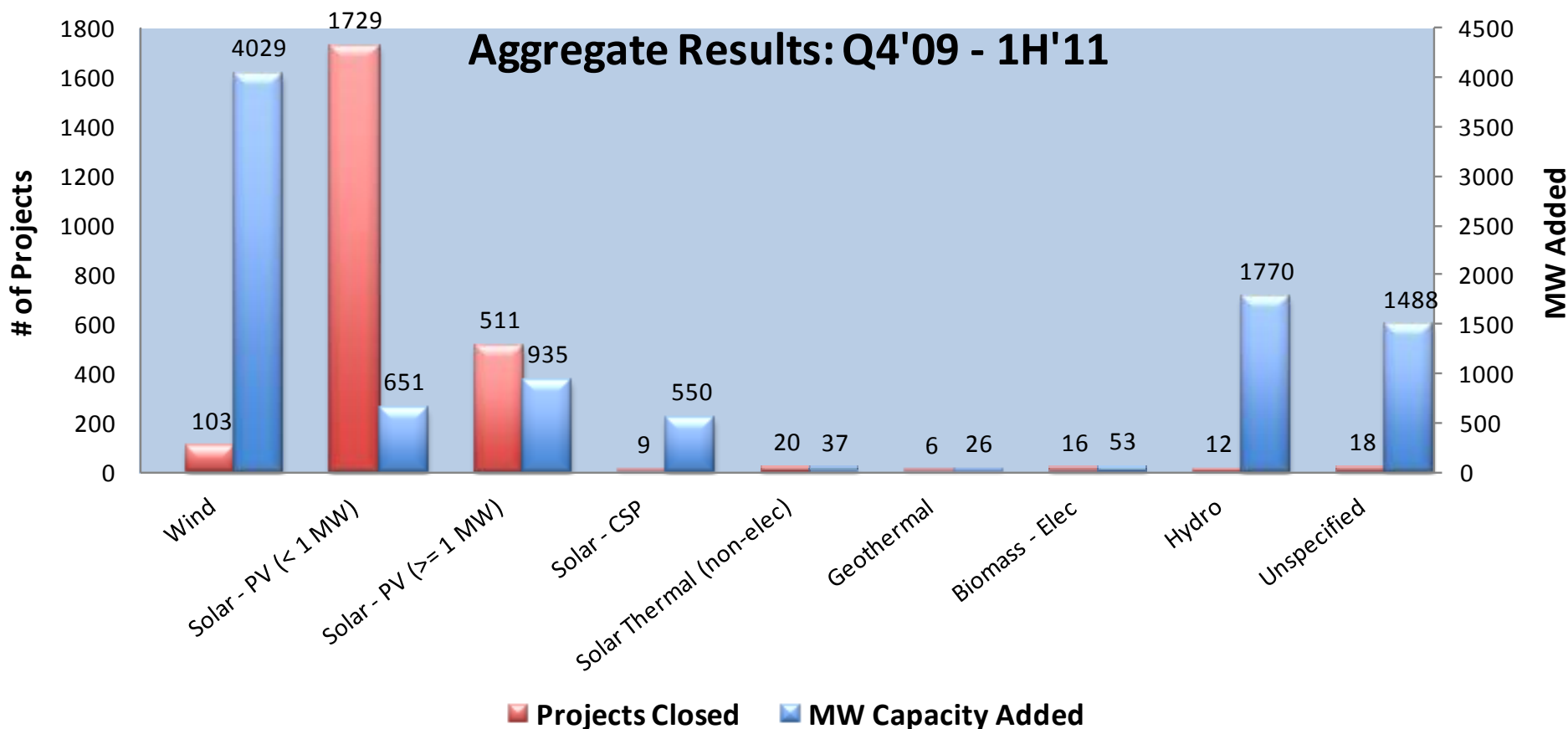
Capacity of Projects Financially Closed



Roughly 478 projects were reported to have reached some form of financial closure by REFTI participants, totaling 2,250 MW of added capacity.

(Values estimated based on mid-point of questionnaire bins)

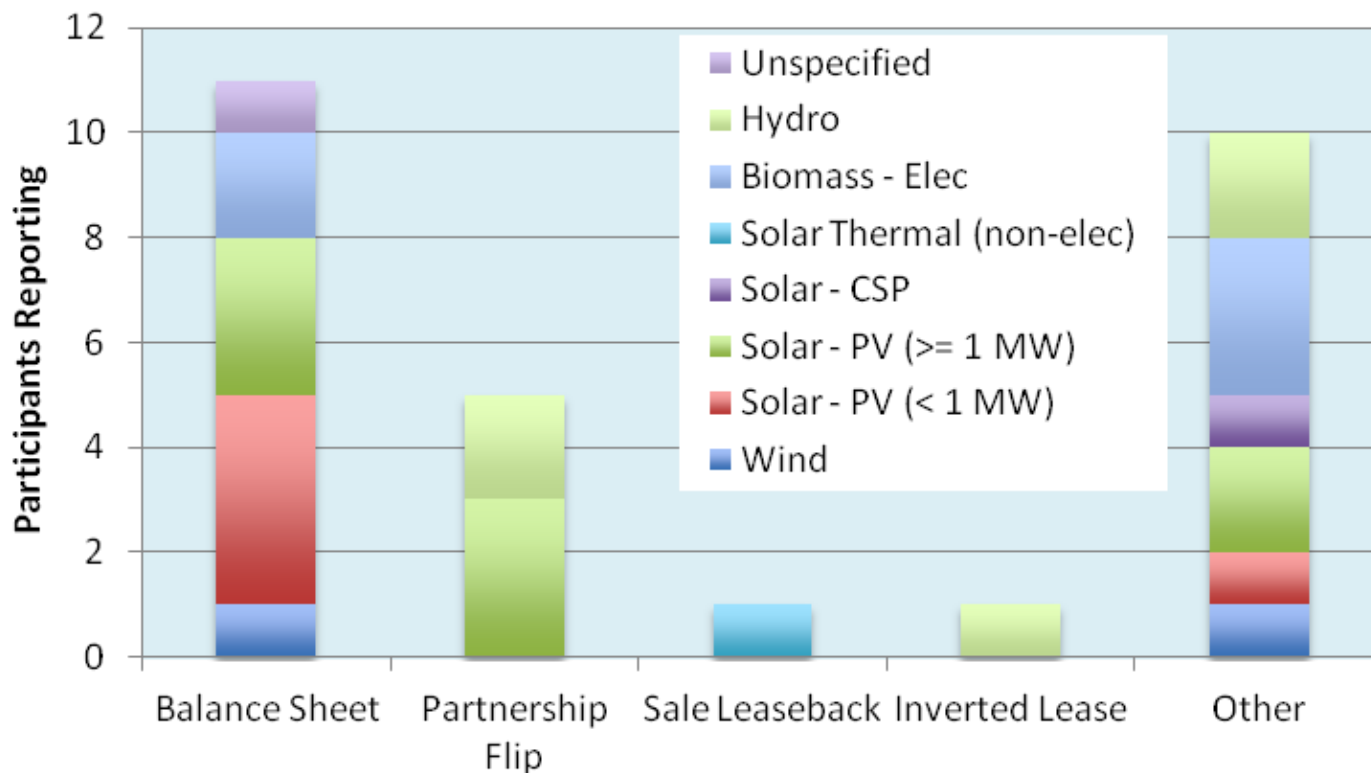
Projects Development Reported via REFTI



In total, since Q4 '09, REFTI has collected info on 2,426 projects representing over 9,500 MW based on mid-point of bin ranges. Small PV has represented most projects, wind the most MW

Financial Structure

1H'11

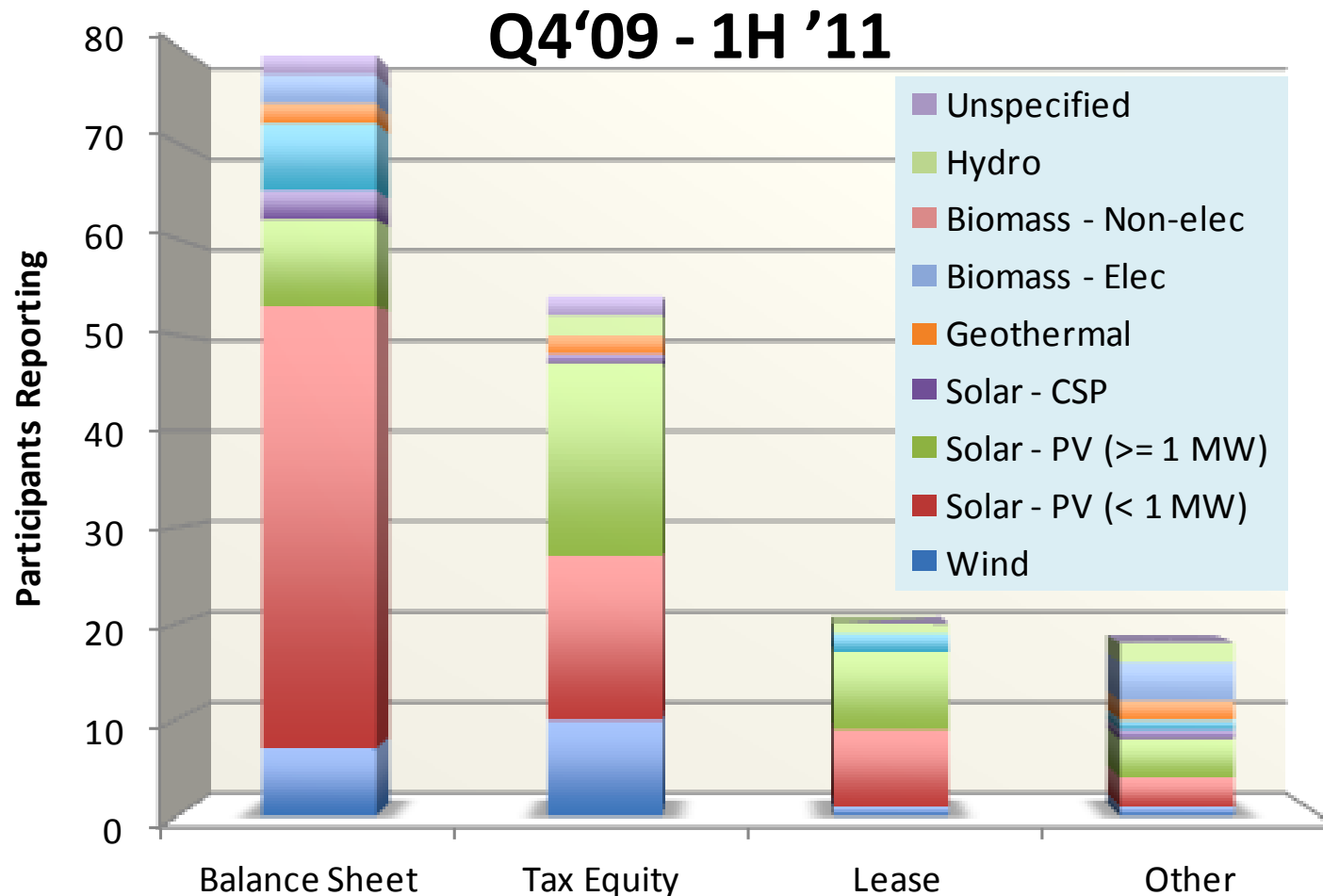


“Other” financial structures include:

- “Institutional sharing trust”
- “Chinese panel manufacturer's US distributor funded the projects.”

Balance sheet financing is most common financial structure, used across most technologies reported. High # of “Other” structures could indicate financing innovation is occurring.

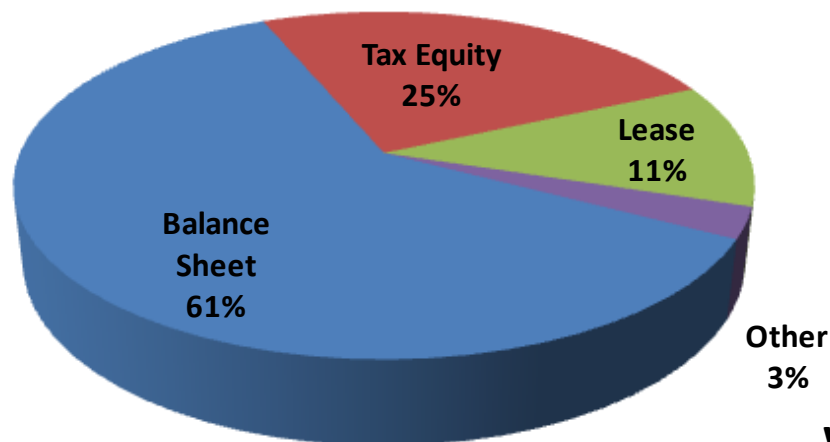
Financial Structure



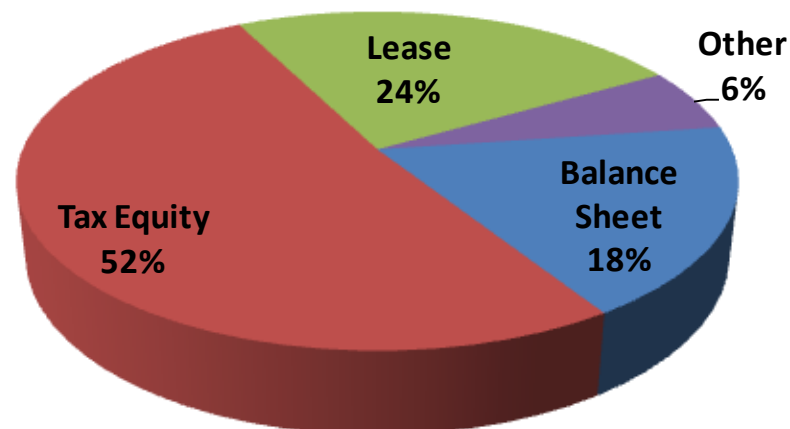
Balance sheet finance represents the most common financial structure reported, followed by tax equity or partnership arrangement.

Financial Structure Q4'09 – 1H'11

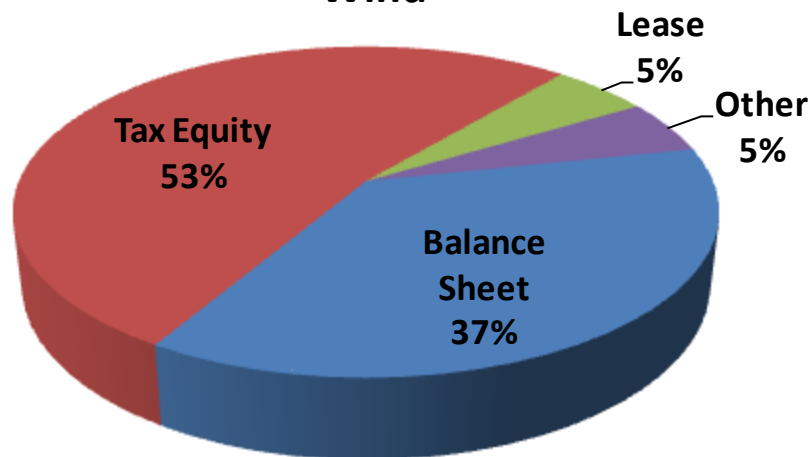
PV < 1MW



PV ≥ 1MW



Wind



Total Respondents:

PV < 1MW = 69

PV ≥ 1MW = 33

Wind = 19

Tax equity partnerships are most common for large PV and wind, less common in small PV, where balance sheet financing is common.

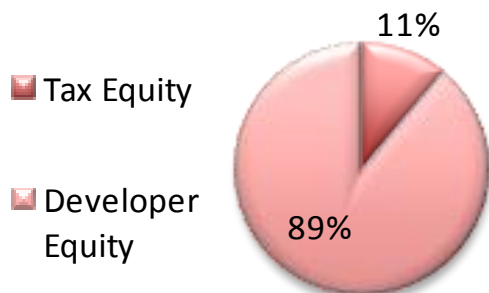
REFTI Questionnaire: 1H'11 - Q4

* 4. What are the Tax equity and Developer equity investments in the project(s)?

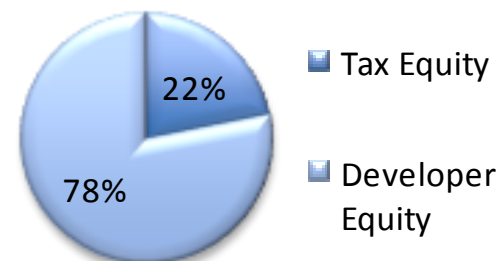
| | Tax-Investor Equity / Total Equity (%) | Expected Return on Tax-Investor Equity (%) | Expected Return on Developer Equity (%) |
|--------------------|---|---|--|
| Primary Technology | <input type="text"/> ▼ | <input type="text"/> ▼ | <input type="text"/> ▼ |

Equity Ratios – 1H'11

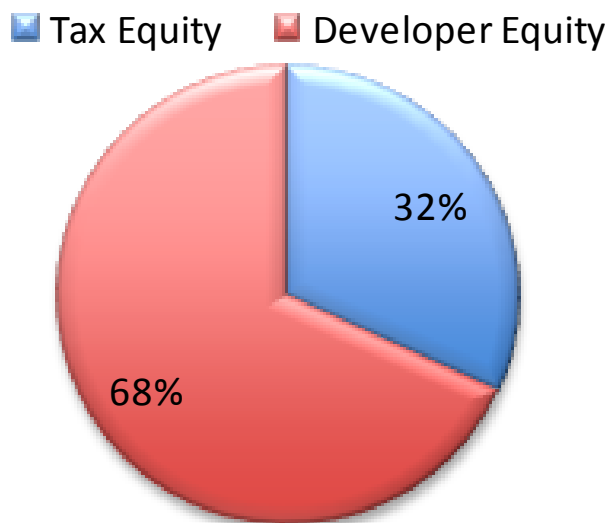
Solar - PV (< 1 MW)



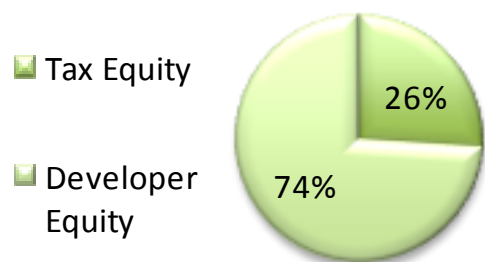
Solar - PV (>= 1 MW)



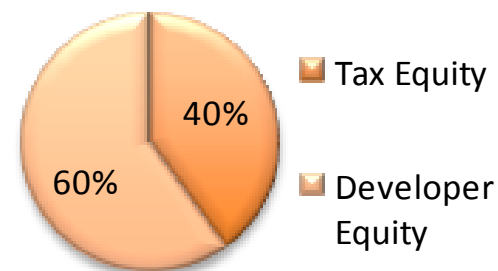
All Technologies



Biomass - Elec

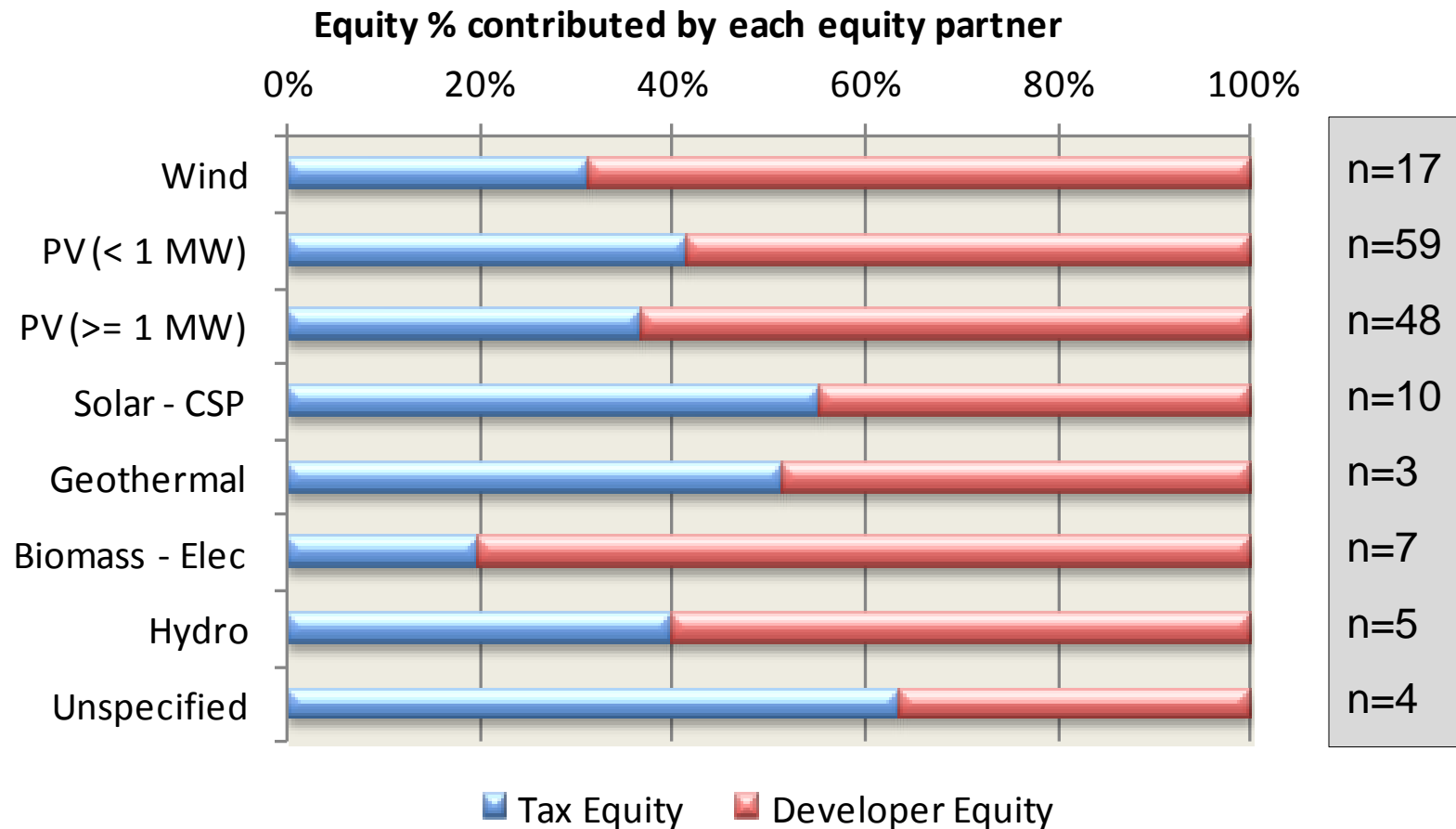


Hydro



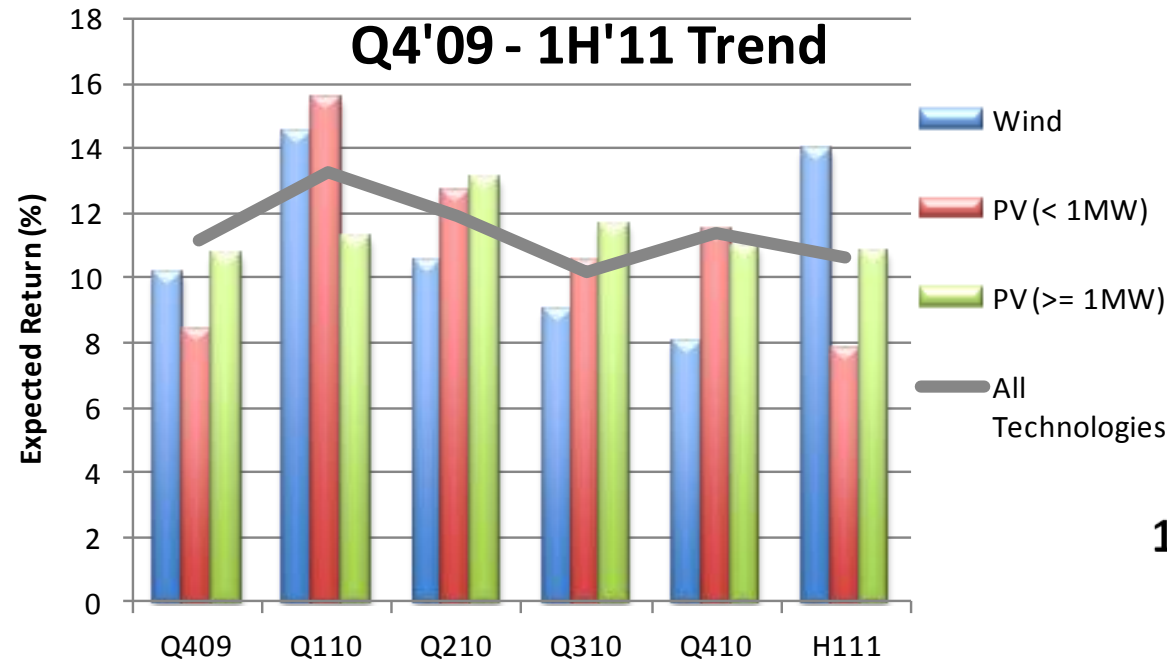
Developer equity represents larger share of equity investment, especially for small PV; less so for hydro.

Equity Ratios by Technology Q4'09 – 1H'11



Tax equity investors provide 20% - 60% of total equity for projects as reported through REFTI. Solar CSP had the largest tax equity investment among specified technologies.

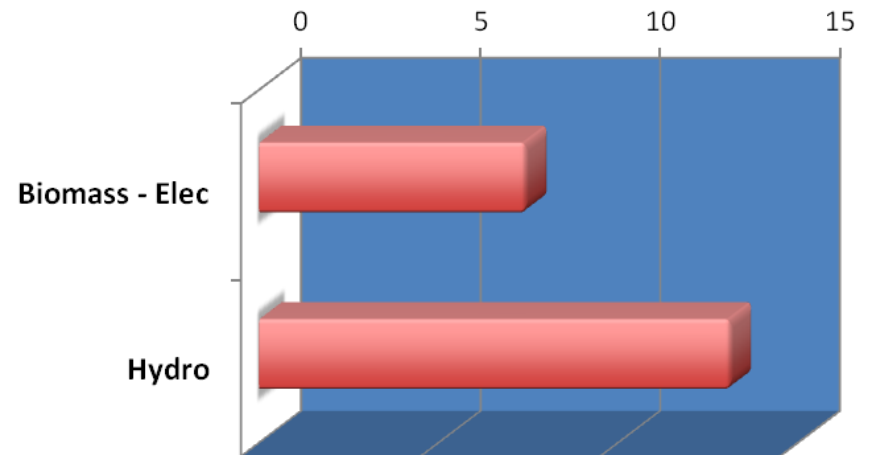
Expected Return on Tax-Investor Equity



Biomass – Elect
reportedly below avg
expected TE return for
1H'11, Hydro is above.

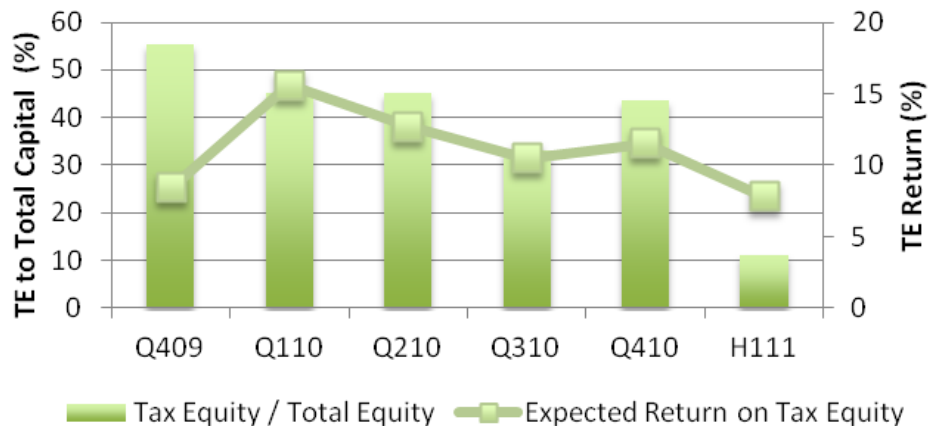
No clear trend in expected TE return. Below avg. reported in 1H'11 for small PV (n=5). Above avg. reported for Wind (n=2). Avg for the time period is just over 10%.

1H'11 Expected TE Return (%)

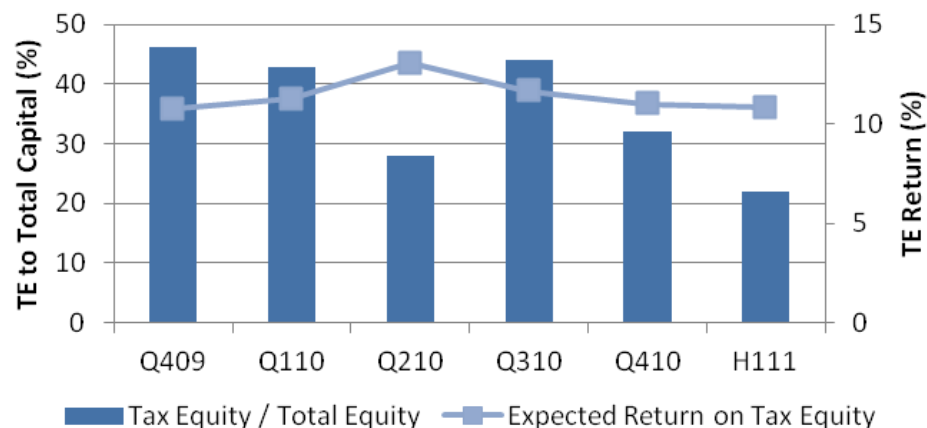


Tax Equity Ratio v. Expected Return

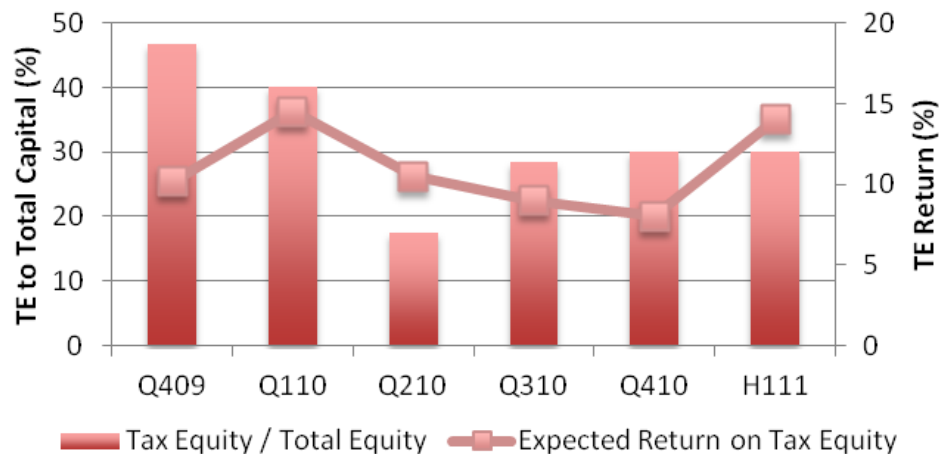
PV < 1MW



PV >=1MW



Wind



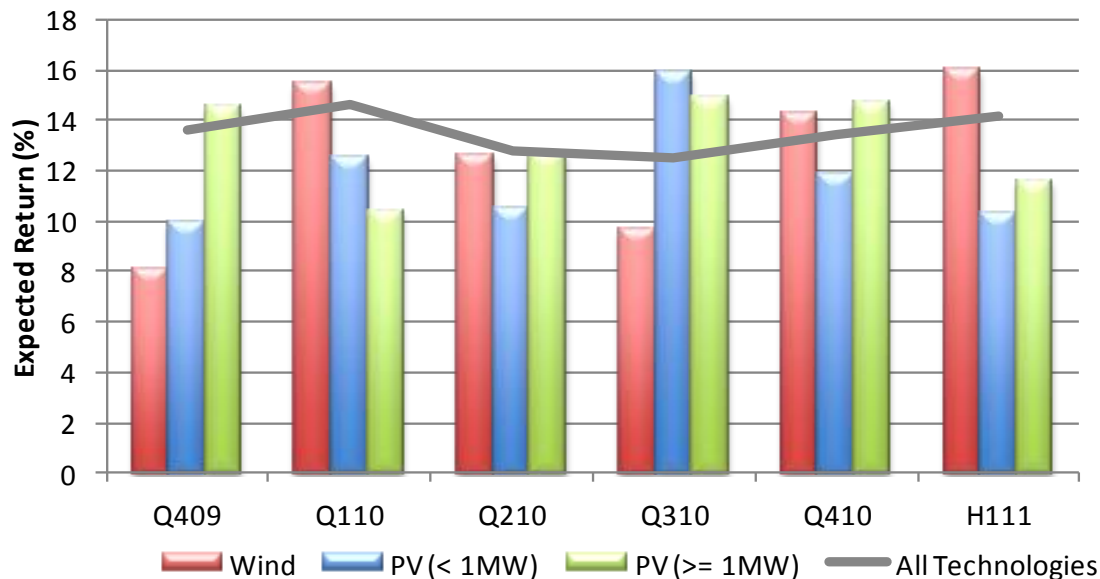
Expected TE returns apparently declining for small PV. Large PV relatively flat at 11%.

Increase in wind TE returns possible aberration, but does match Q1 '10 reported values.

Total Respondents:
 PV < 1MW = 59 & 54
 PV >= 1MW = 48 & 45
 Wind = 17 & 16

Return on Developer Equity

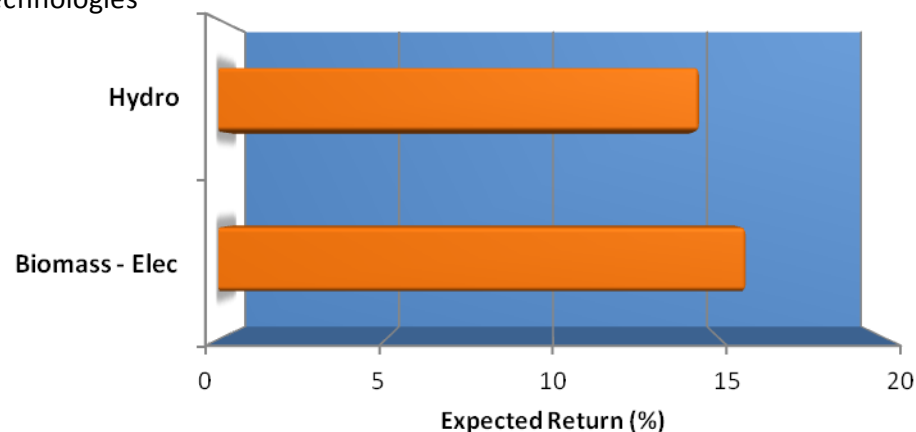
Q4'09 - 1H'11 Trend



Total Respondents:
 Wind = 16
 PV < 1MW = 49
 PV >= 1MW = 47

Flat, stable trend compared to TE returns. Expected developer equity yields reported slightly higher than tax equity in 1H'11. PV lower than Hydro and Biomass – Elec

1H'11 Expected Return (%)



REFTI Questionnaire: Q5

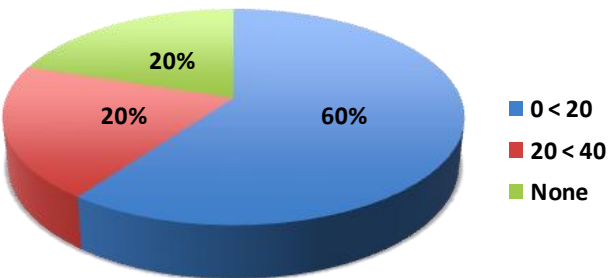
***5. Please describe the Term (i.e. permanent) Debt of the project(s).**

| | Debt / Total Capital (%) | Avg. All-In Cost of Debt (%) | Debt Term (yrs) | Avg. Debt Coverage Ratio Required |
|--------------------|--------------------------|------------------------------|------------------------|-----------------------------------|
| Primary Technology | <input type="text"/> ▼ | <input type="text"/> ▼ | <input type="text"/> ▼ | <input type="text"/> ▼ |

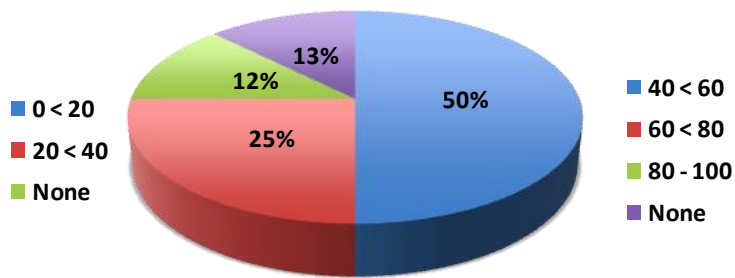
Debt to Capital

1H'11

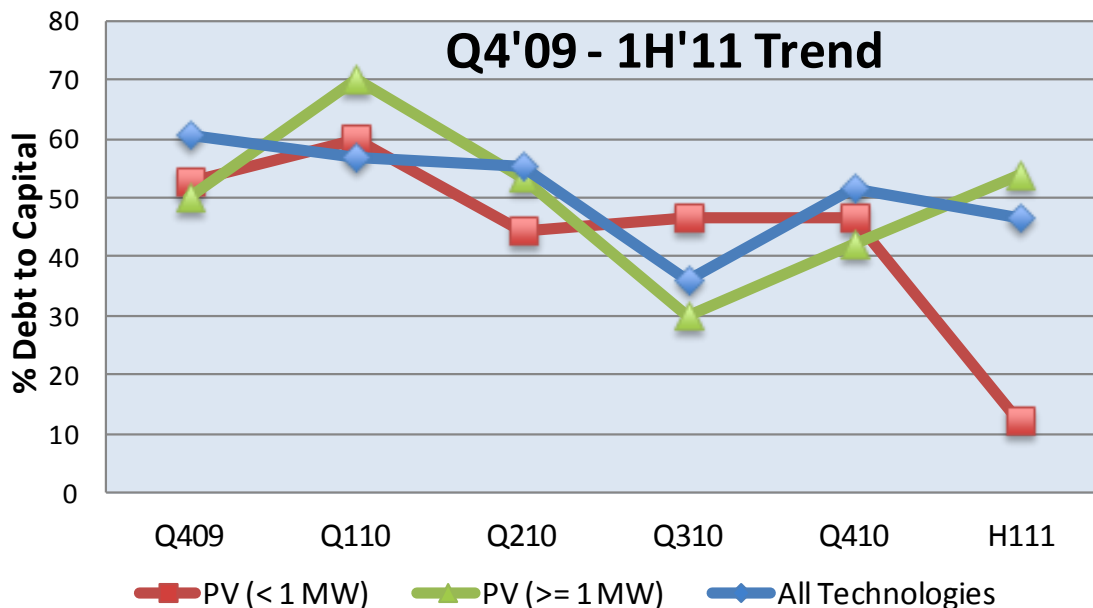
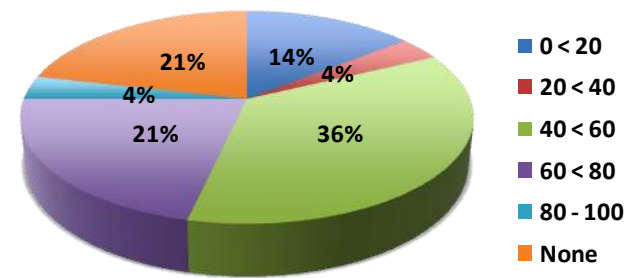
PV (< 1 MW)



PV (>= 1 MW)



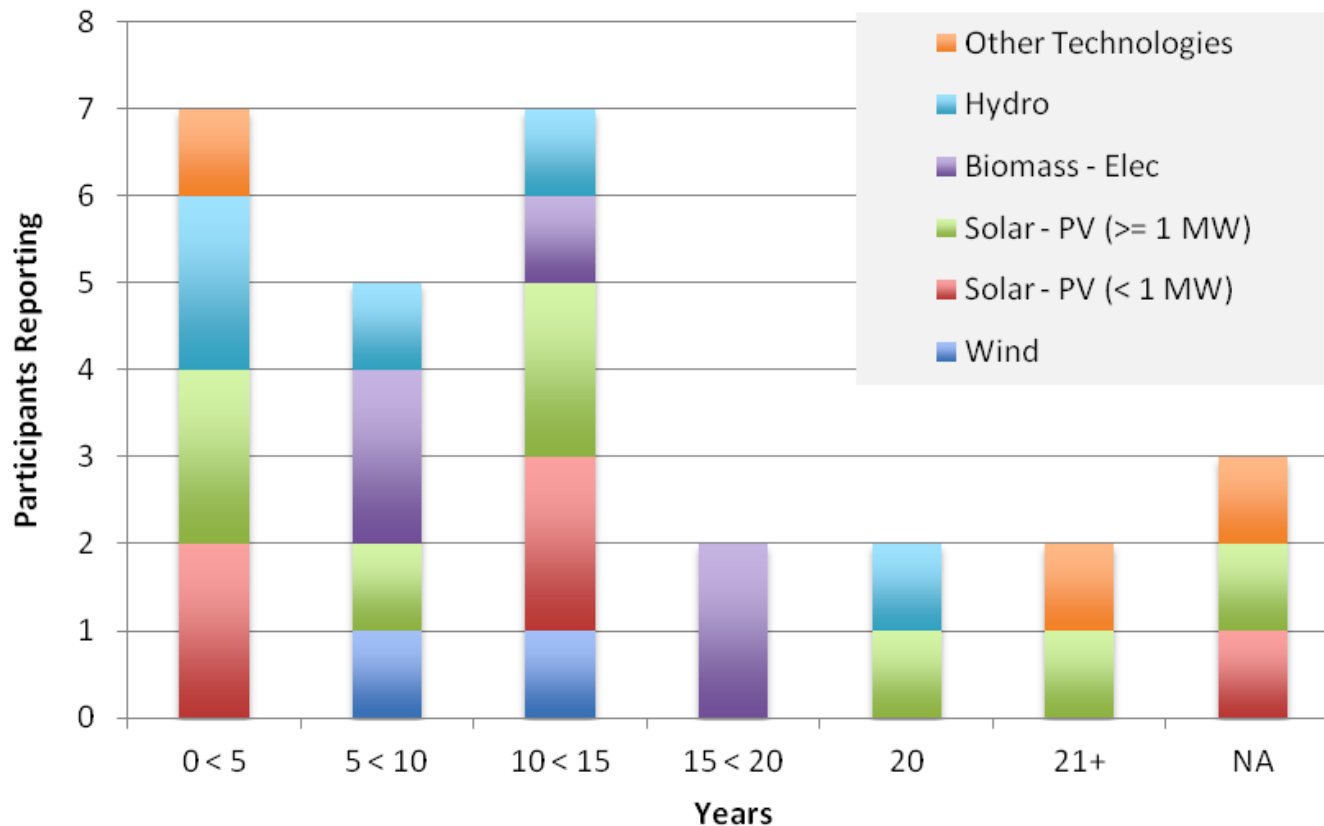
All Technologies



Use of debt dependent on technology and project size. Across all techs, debt is most commonly 40-60% of total project capitalization.

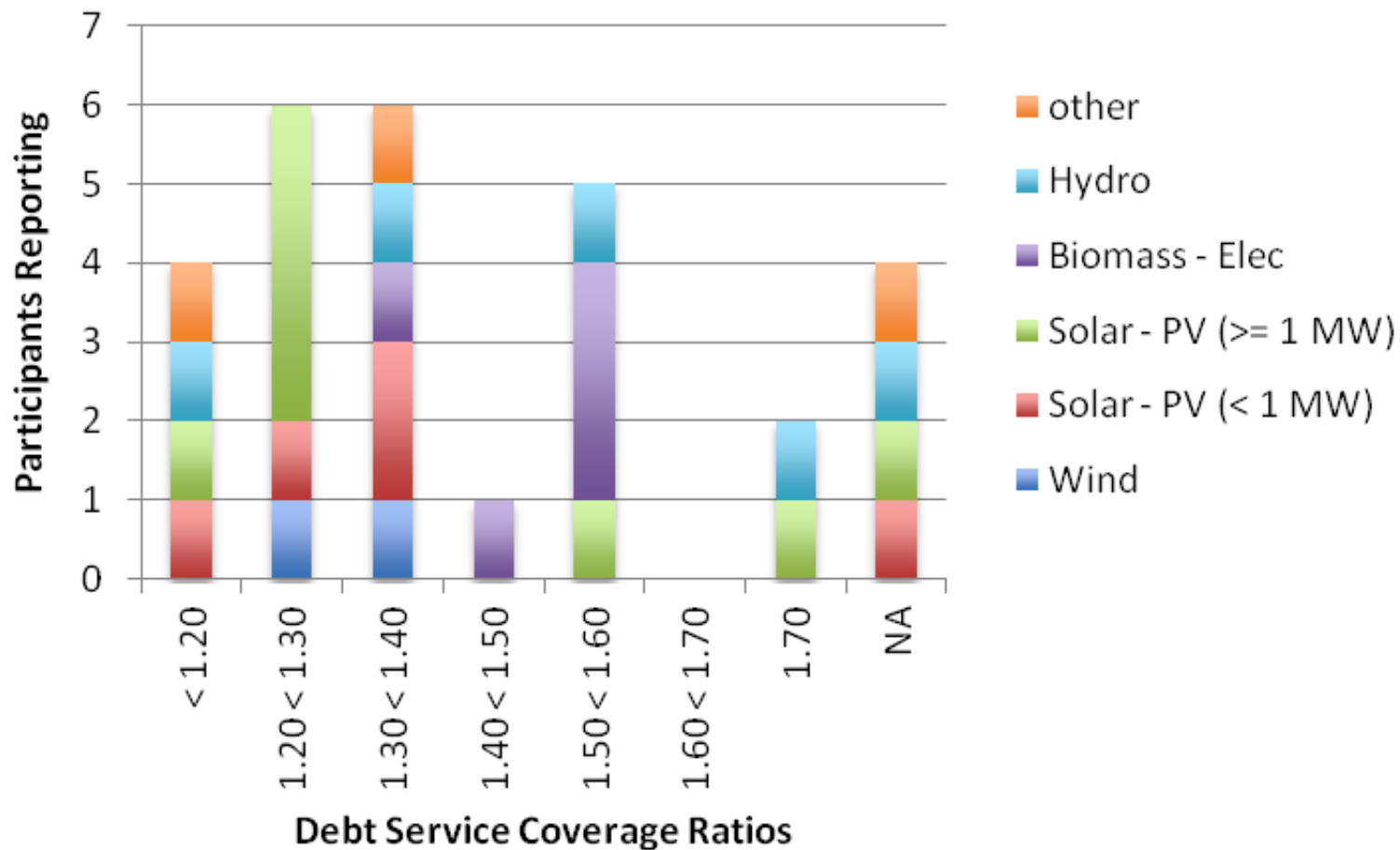
Total Respondents:
 PV < 1MW = 40
 PV >= 1MW = 40
 All Technologies = 128

Term Debt Duration



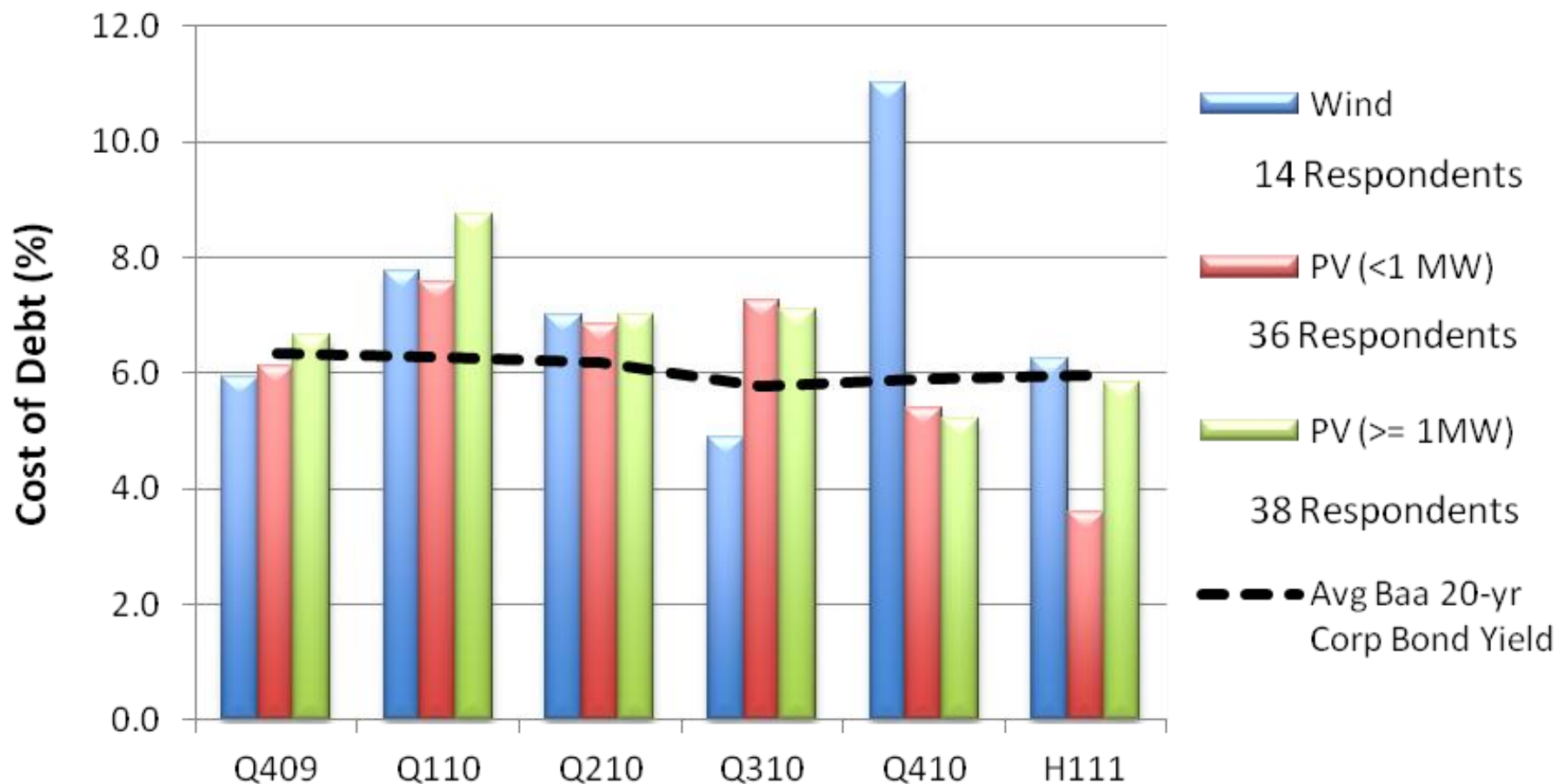
Debt durations (tenor) are relatively short (most less than 15 years), results comprised mostly of large PV, hydro, biomass

Required Debt Service Coverage Ratios



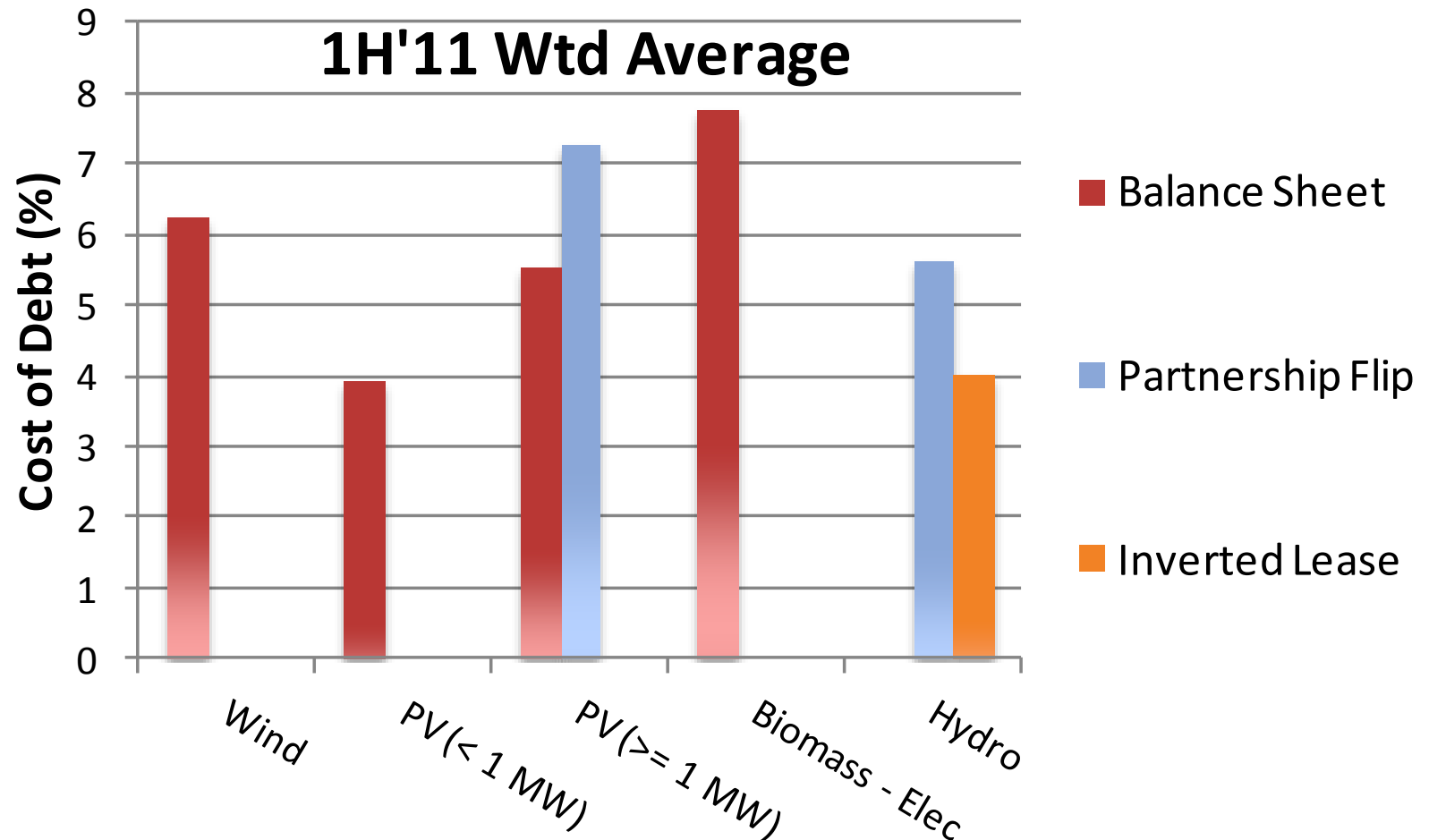
Minimum debt coverage ratios are most commonly in the 1.2 – 1.4x range. 60% of biomass is higher at 1.5 – 1.6x, representing higher risk (likely fuel supply risk). Hydro DSCR all over the map.

Cost of Debt v. Baa 20yr Corp Bond Yield



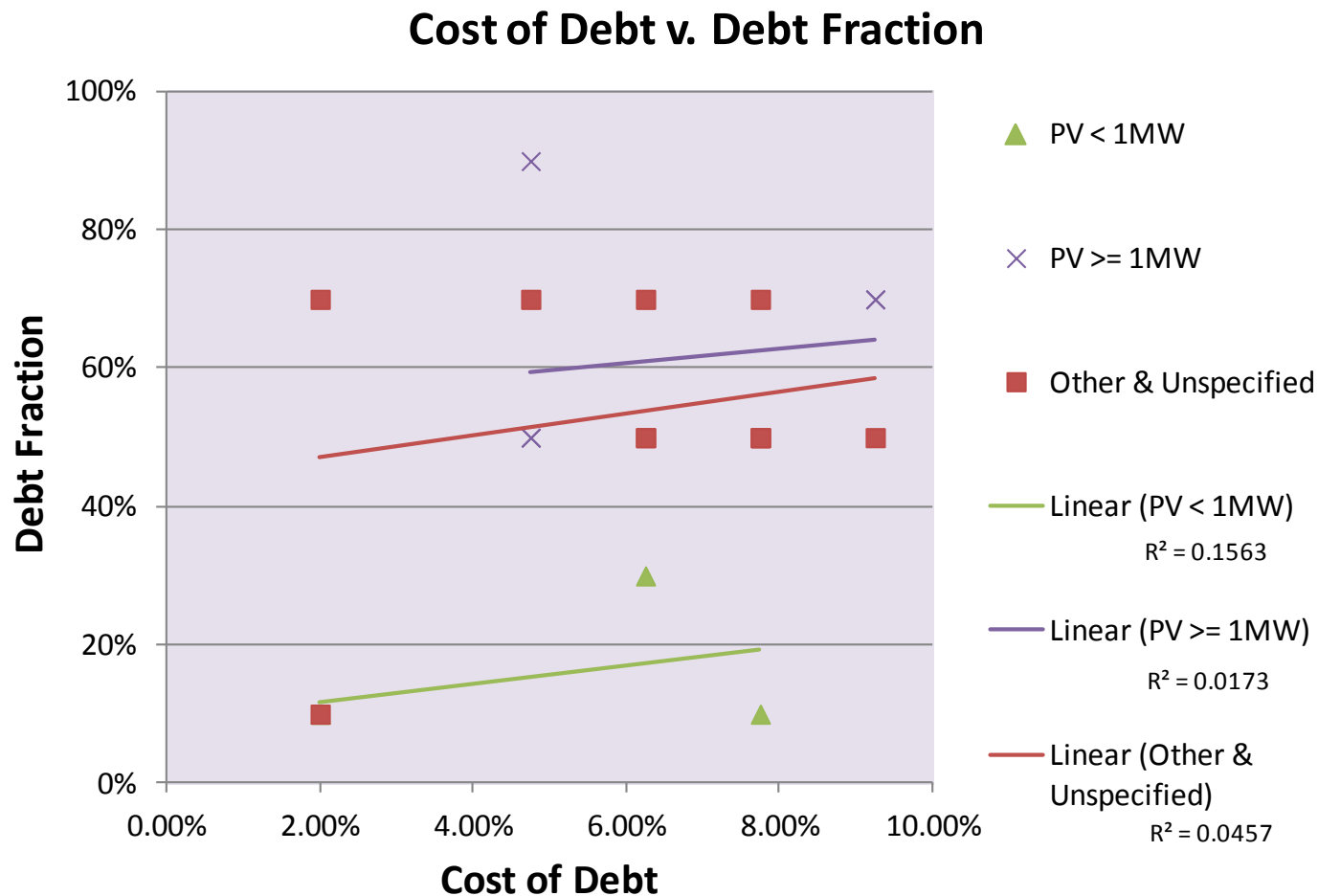
RE projects reported cost of debt currently below mid-level corporate bond rate, although it has varied over the past 2 years.

Cost of Debt by Financial Structure/Tech



Debt was mostly included via balance sheet structures, ranging between 4-8%. Partnership flips included debt, costing between 5.5% - 7.2%.

Cost of Debt by Financial Structure



New questionnaire design allows for greater statistical analysis. But lack of statistical significance due to lack of data. Cost of debt positively correlated with debt fraction

REFTI Questionnaire: Q6

***6. What is the total estimated Installed Costs *before incentives* and Levelized Cost of Energy (LCOE) *after incentives* from the project(s)?**

(LCOE equals the present value of project costs divided by the present value of energy delivered)

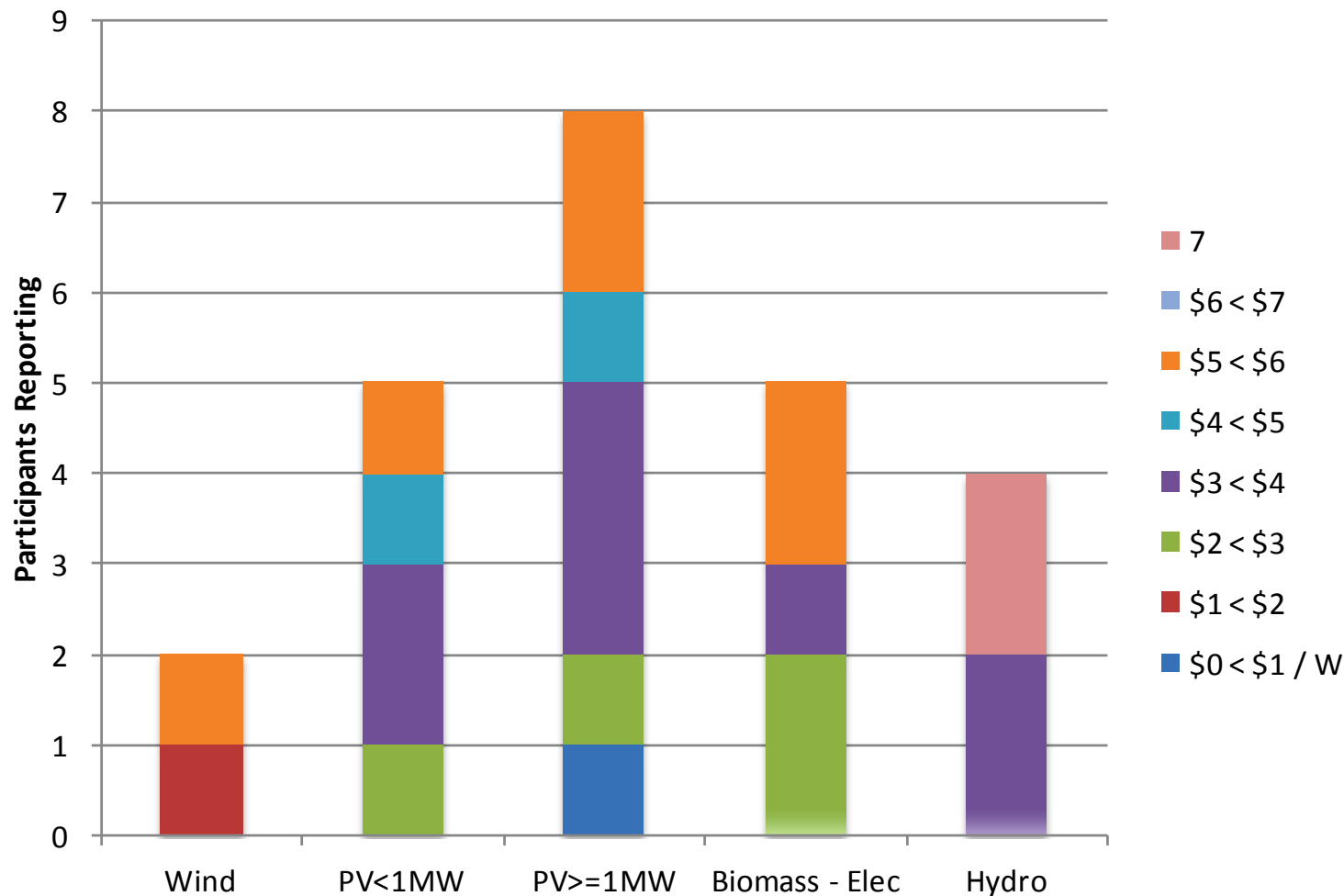
Est. Installed Costs (\$ / Watt - net output)

Est. LCOE (\$ / kWh)

Primary Technology

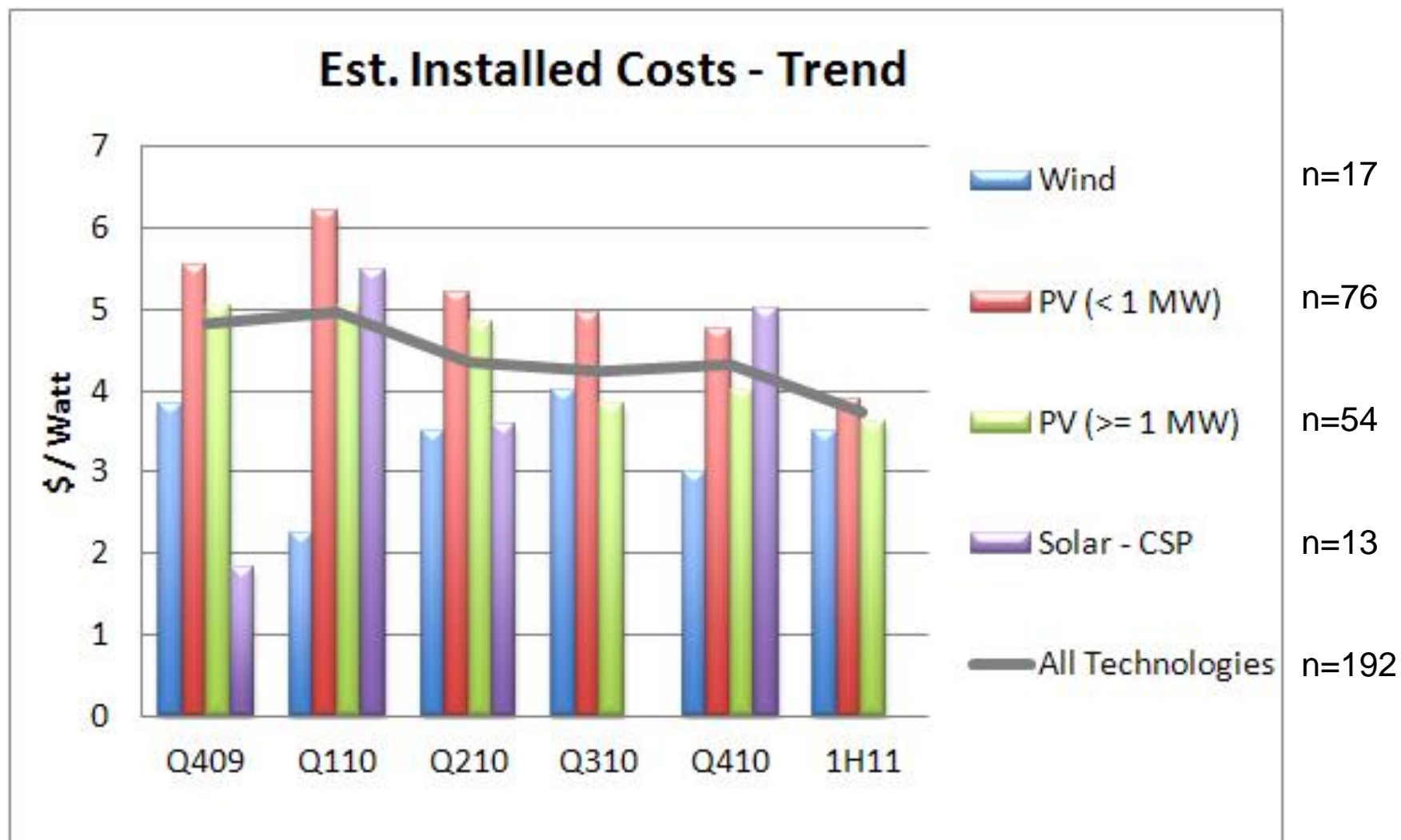


Installed Costs (before incentives) – 1H'11



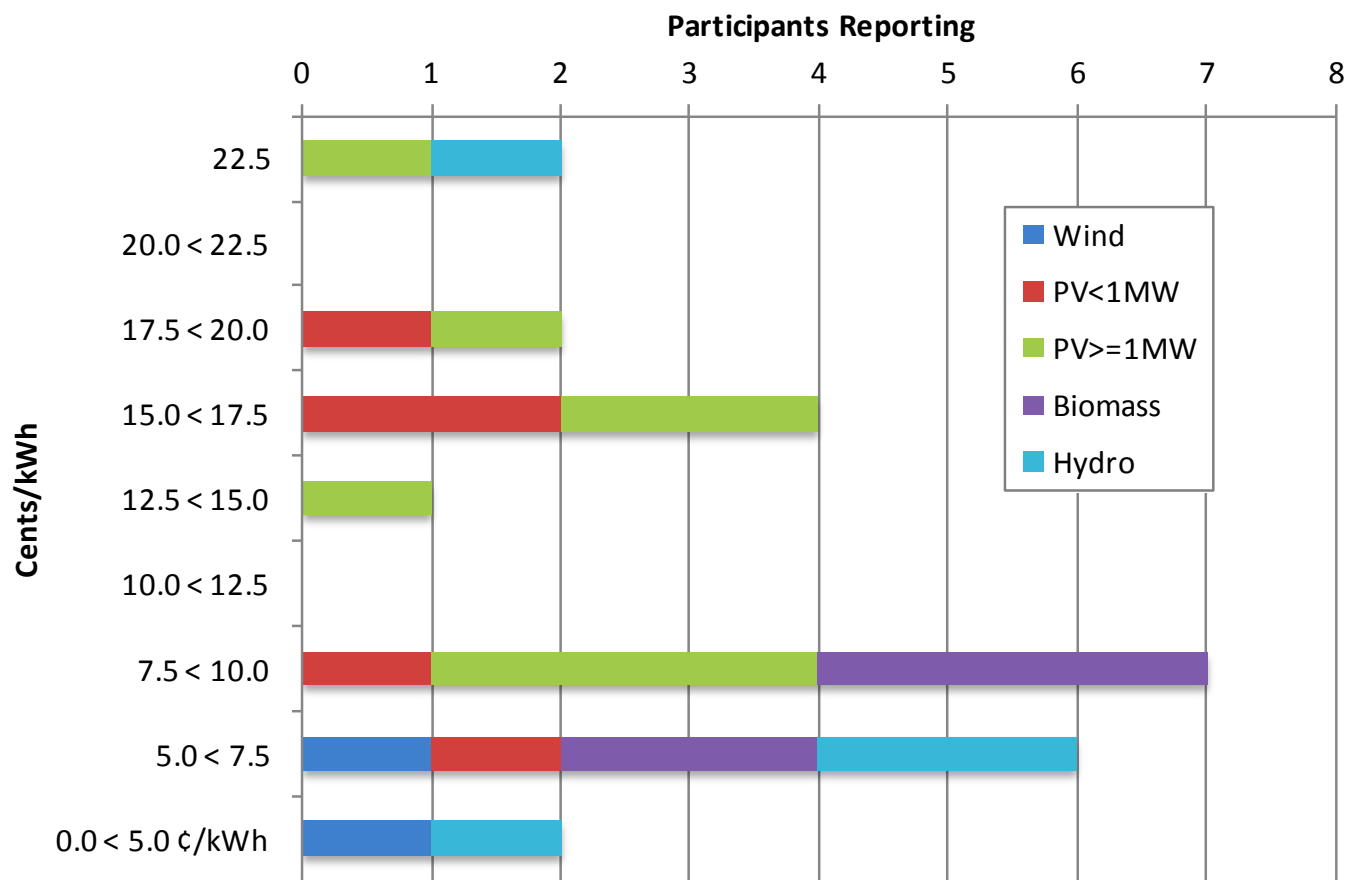
Wide range for large PV reported, in contrast to Q4 10. Wind and hydro display barbell spreads.

Installed Costs –Trend Analysis



Large and small PV show most consistency, with gradual declines in both. Weighted average across technologies also consistent.

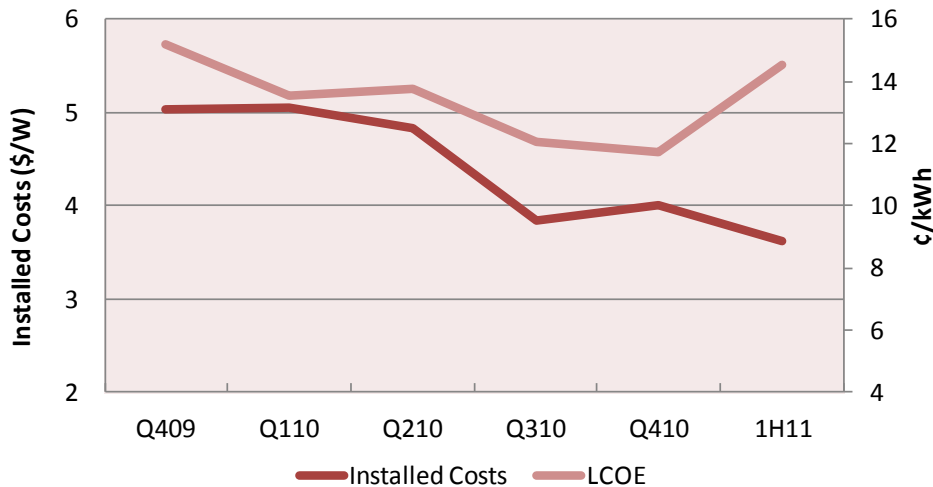
Levelized Cost of Energy (¢/kWh) – 1H'11



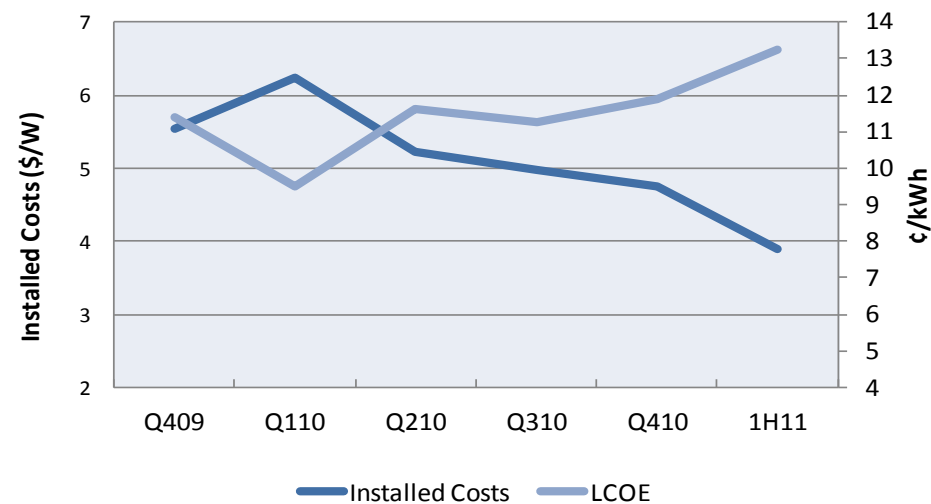
Projects most commonly reporting in the 5-10 cents/kWh range. Large and small PV all over the map, likely depending on geographic-specific incentives.

Installed Costs v. LCOE –Trend

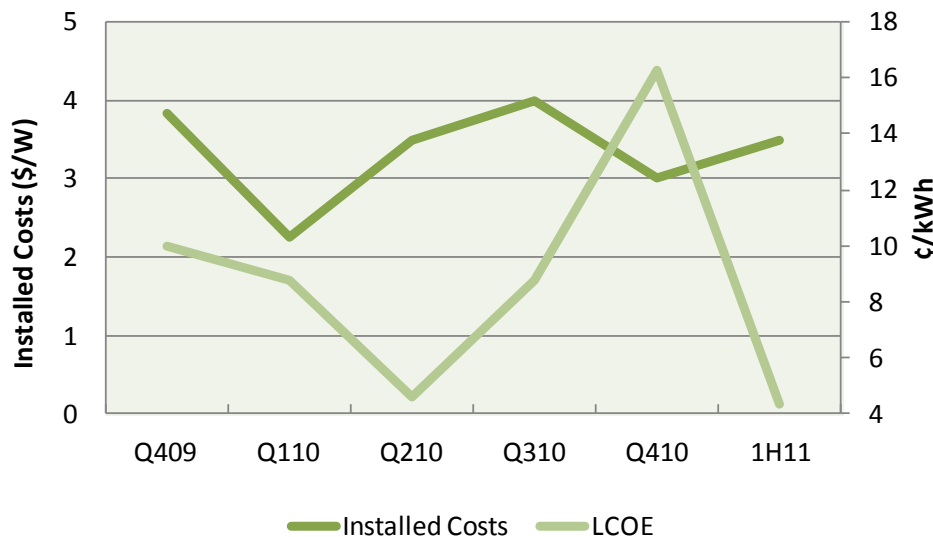
PV >=1MW



PV < 1MW



Wind



Small PV installed costs and LCOE appear inversely related whereas large PV tracks more closely (except 1H'11). Wind is inconsistent showing large swings in Q4'10 and 1H'11.

Total Respondents:

PV < 1MW = 54

PV >= 1MW = 39

Wind = 11

REFTI Questionnaire: Q7

***7. Please describe the Power Purchase Agreement (PPA) for the project(s).**

PPA Term (yrs)

Yr 1 Price (¢ / kWh)

Price Escalation (%)

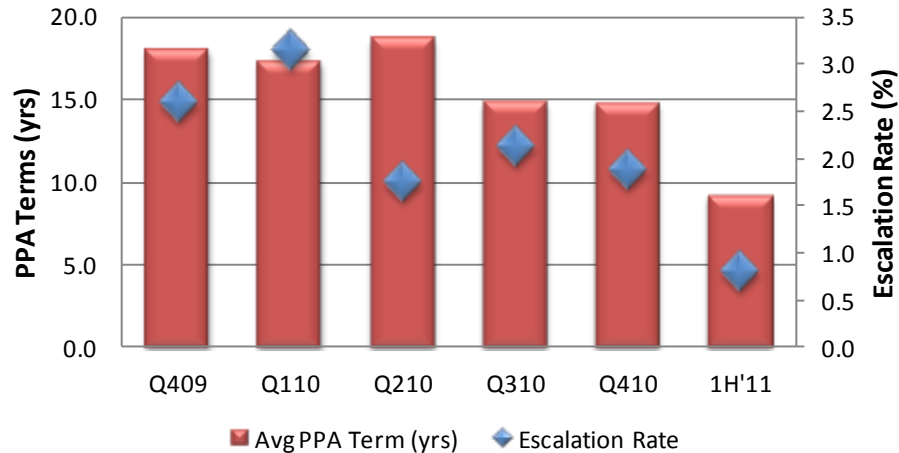
Are RECs Included?

Primary Technology

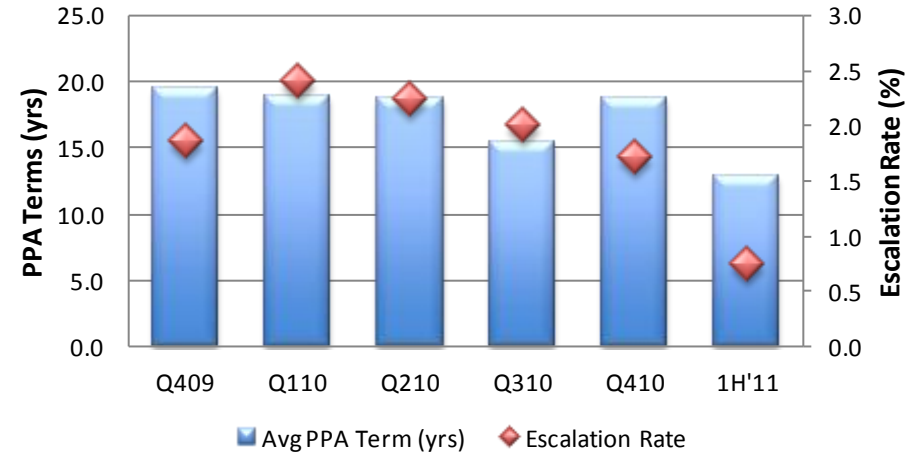


Average PPA Term v. Escalation Rate - Trend

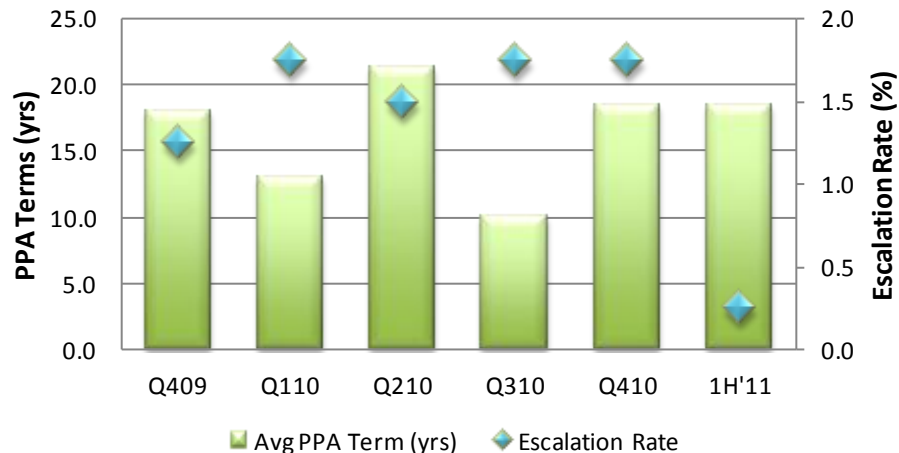
PV < 1MW



PV >= 1MW



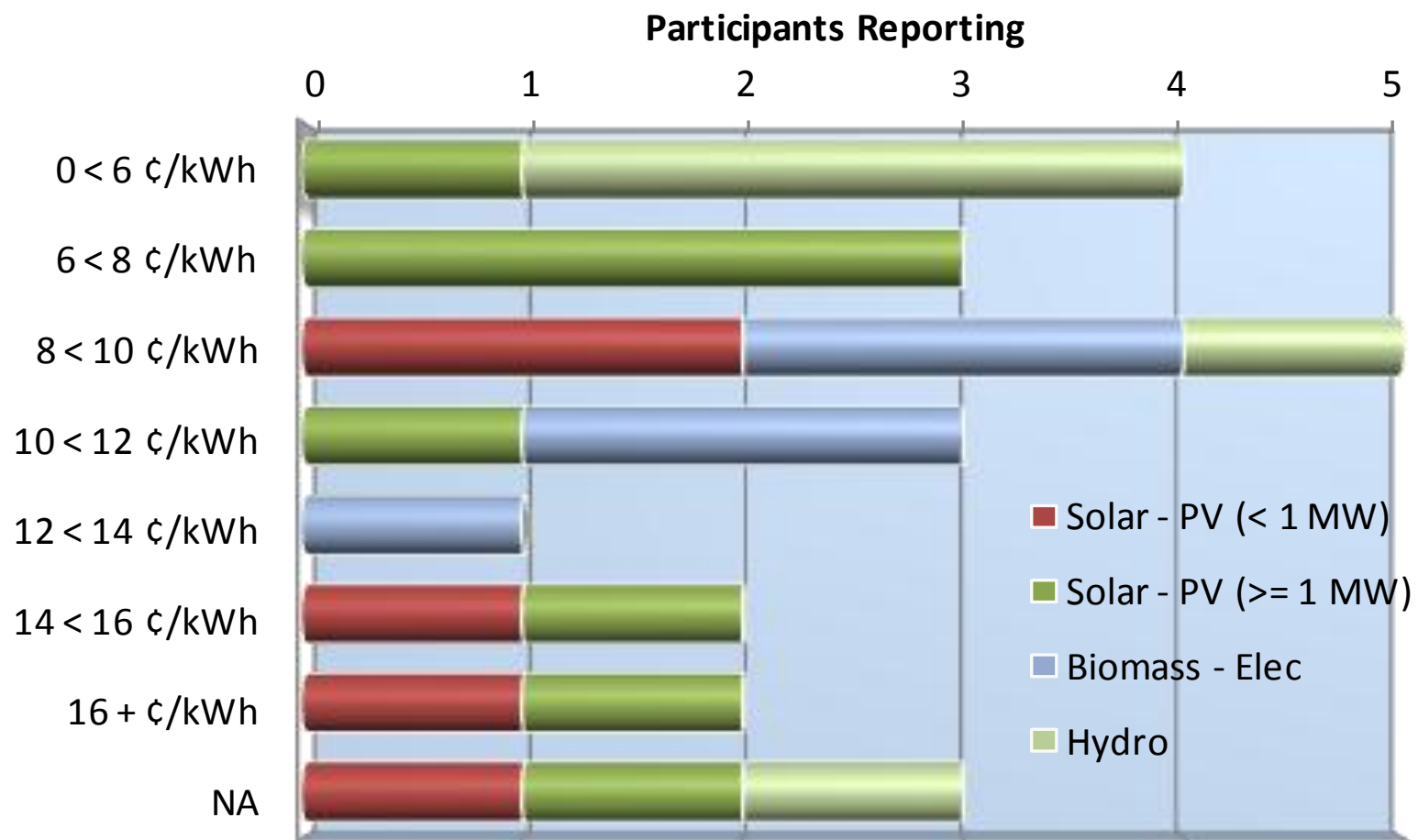
Wind



PPA term is declining for PV and stable for wind. Escalation rates are declining as well. No well-defined trend is evident for wind.

Total Respondents:
 PV < 1MW = 54 & 51
 PV >= 1MW = 53 & 45
 Wind = 16 & 13

Year 1 PPA Price – 1H'11



Hydro is at low end – primarily <6 cents. Biomass is mid-range – 8-12 cents/kWh. Solar across the map

REFTI Questionnaire: Q8 (secondary)

8. Please provide the primary form of governmental incentives utilized by the project(s).

Depreciation

Federal Incentive

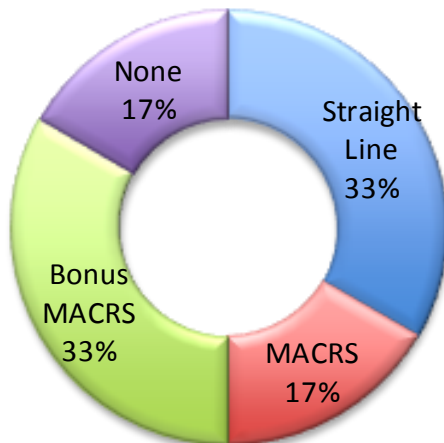
State Incentive

Primary Technology

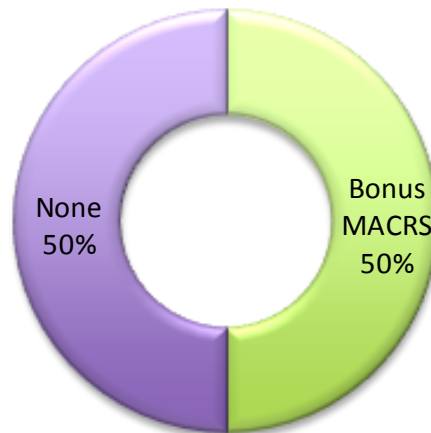
Comments related to government incentives?

Depreciation Incentives Utilized – 1H'11

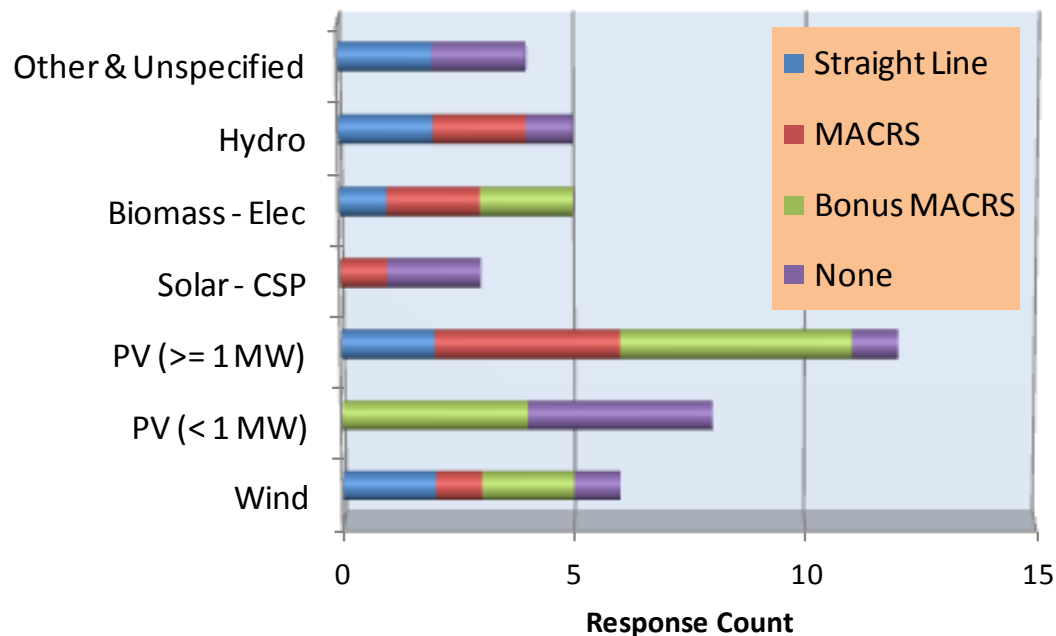
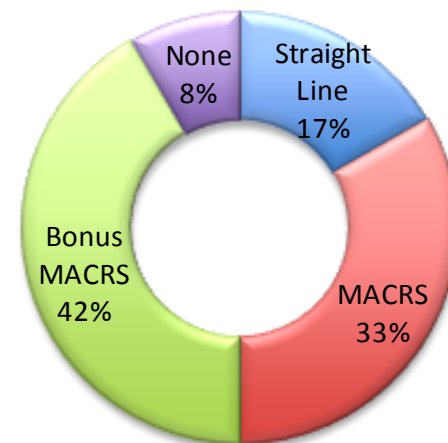
Wind



PV (< 1MW)



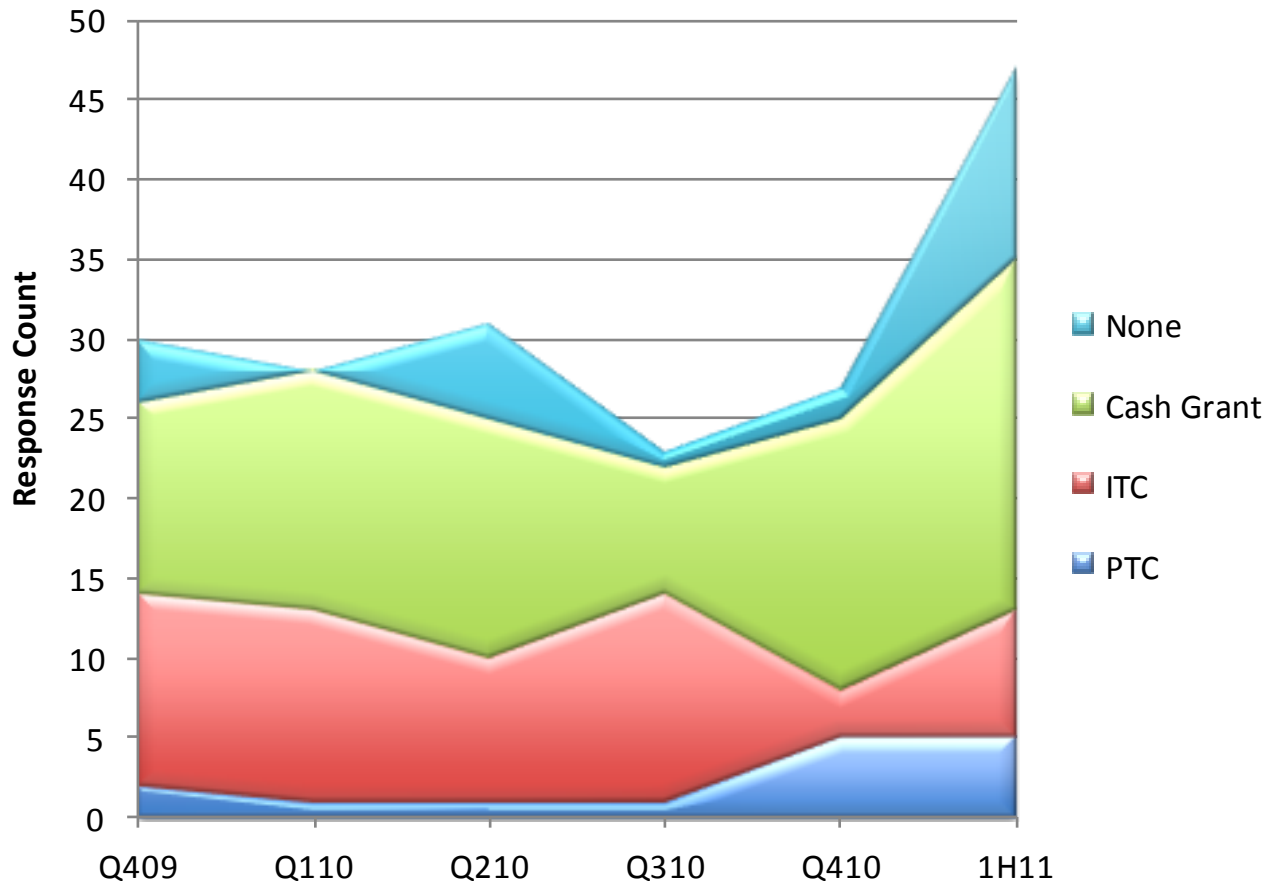
PV (>= 1MW)



Half small PV respondents not utilizing depreciation incentives at all, other half using bonus MACRS. Wind and large PV show wide variety. Data for all technologies in the bar chart

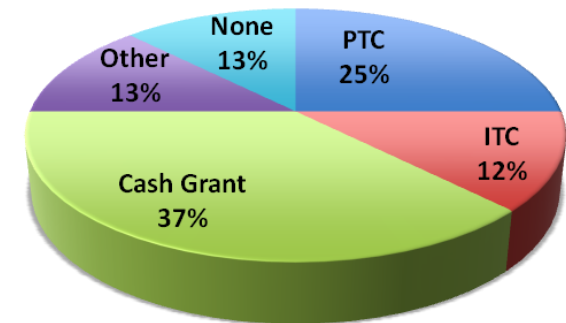
Federal Incentives Utilized

All Technologies - Trend

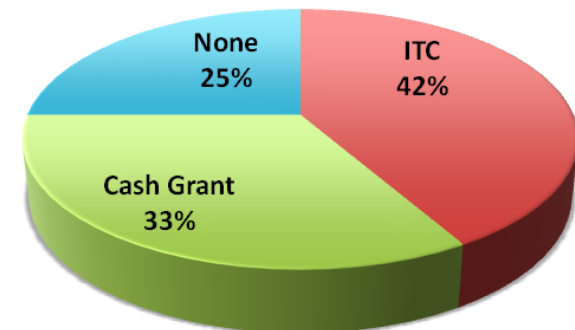


1H'11

PV (< 1MW)

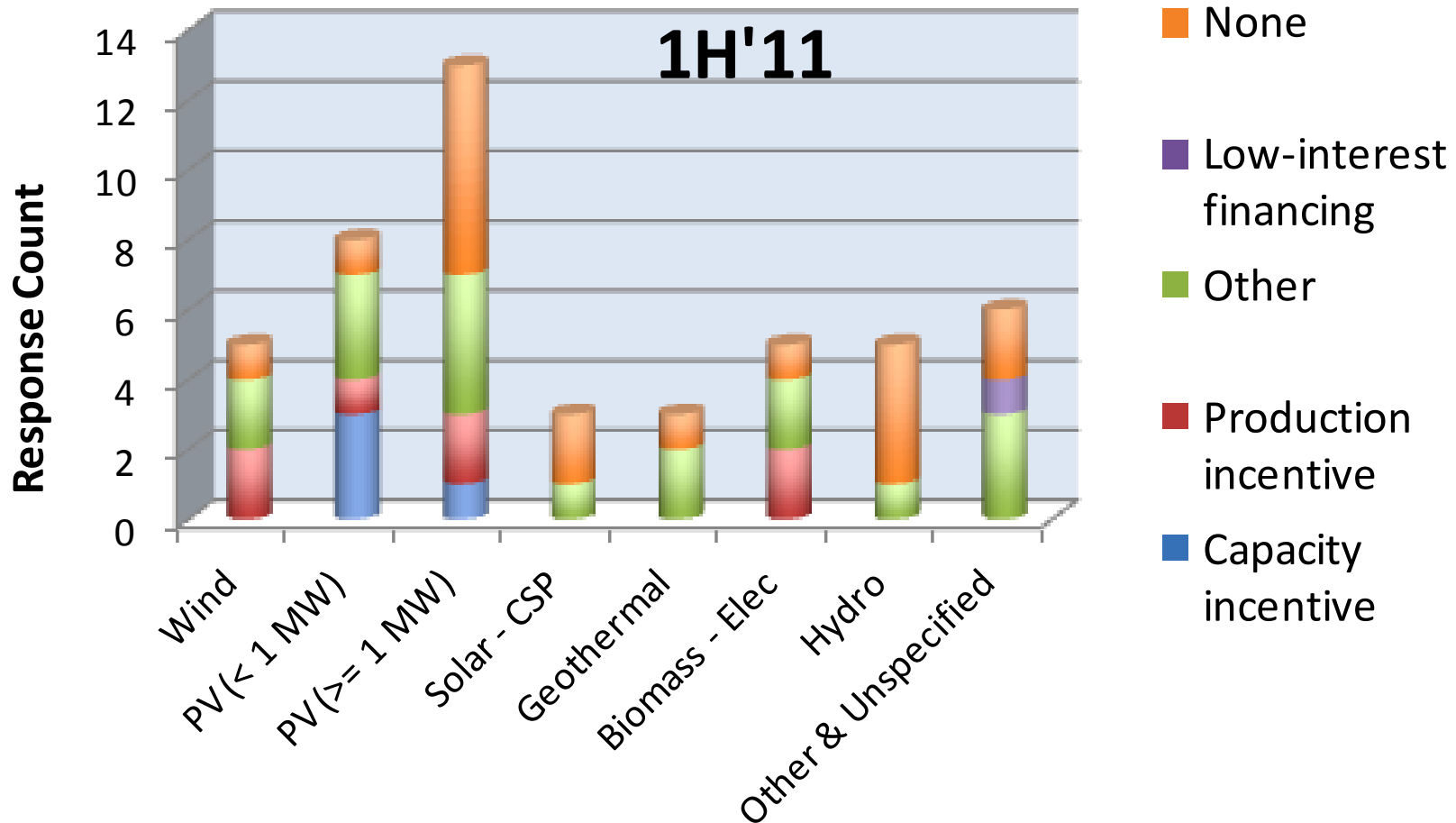


PV(>= 1MW)



Cash grant most popular among all technologies. PTC being utilized more, ITC less. ITC popular for large scale PV.

State Incentives Utilized



State incentives appear less relevant in recent questionnaire period. A large number of “other” incentive forms listed such as “DOE Research Grants”, “Personal LLC tax breaks”, and “OR BETC” referring to the Oregon Business Energy Tax Credit

REFTI Questionnaire: Q9

9. Please comment on the *importance* of the listed factors to the development of the project(s).

PPA with Utility

Federal
Incentives

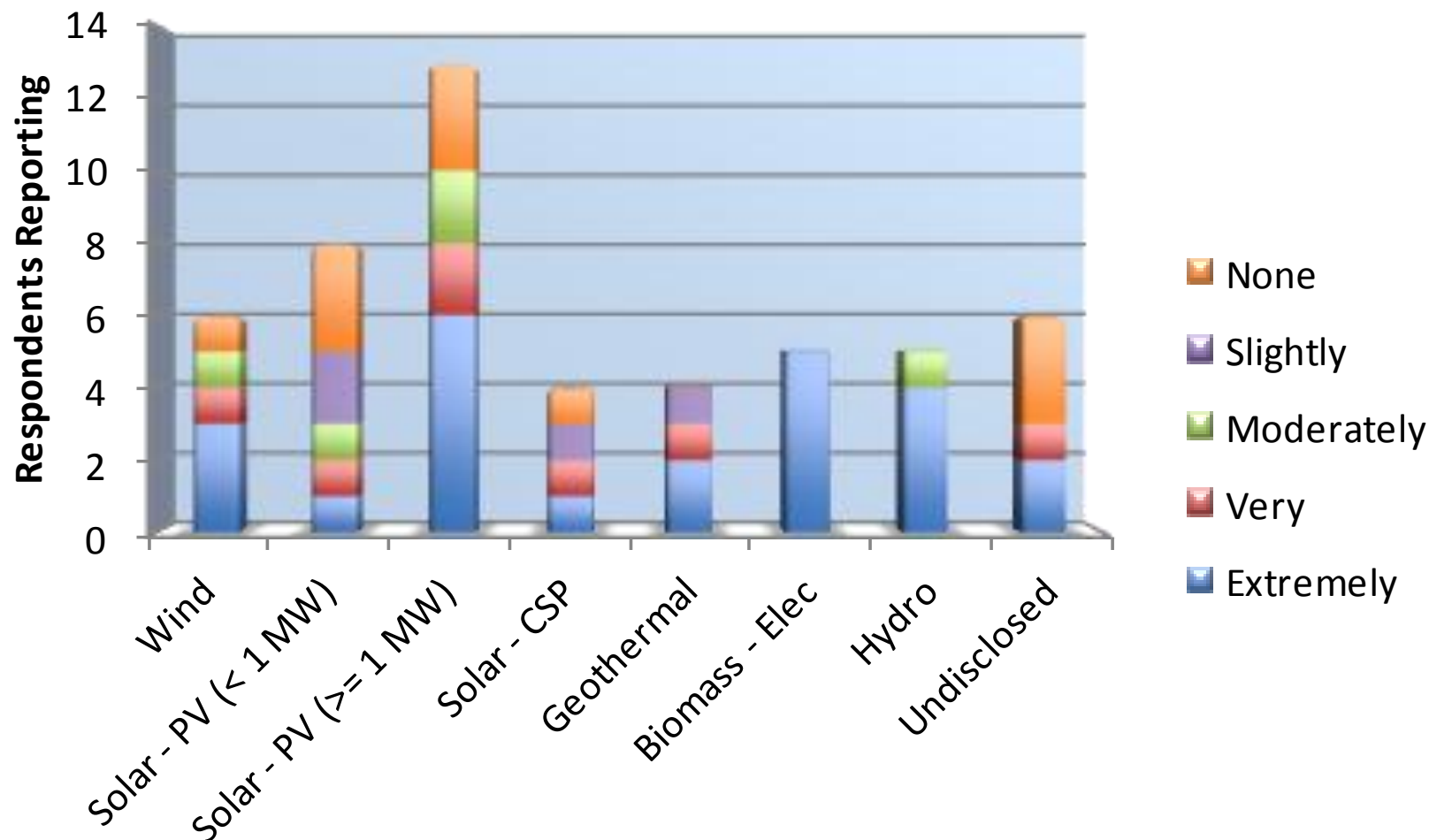
State
Incentives/Mandates

External
Financing

Loan Guarantee

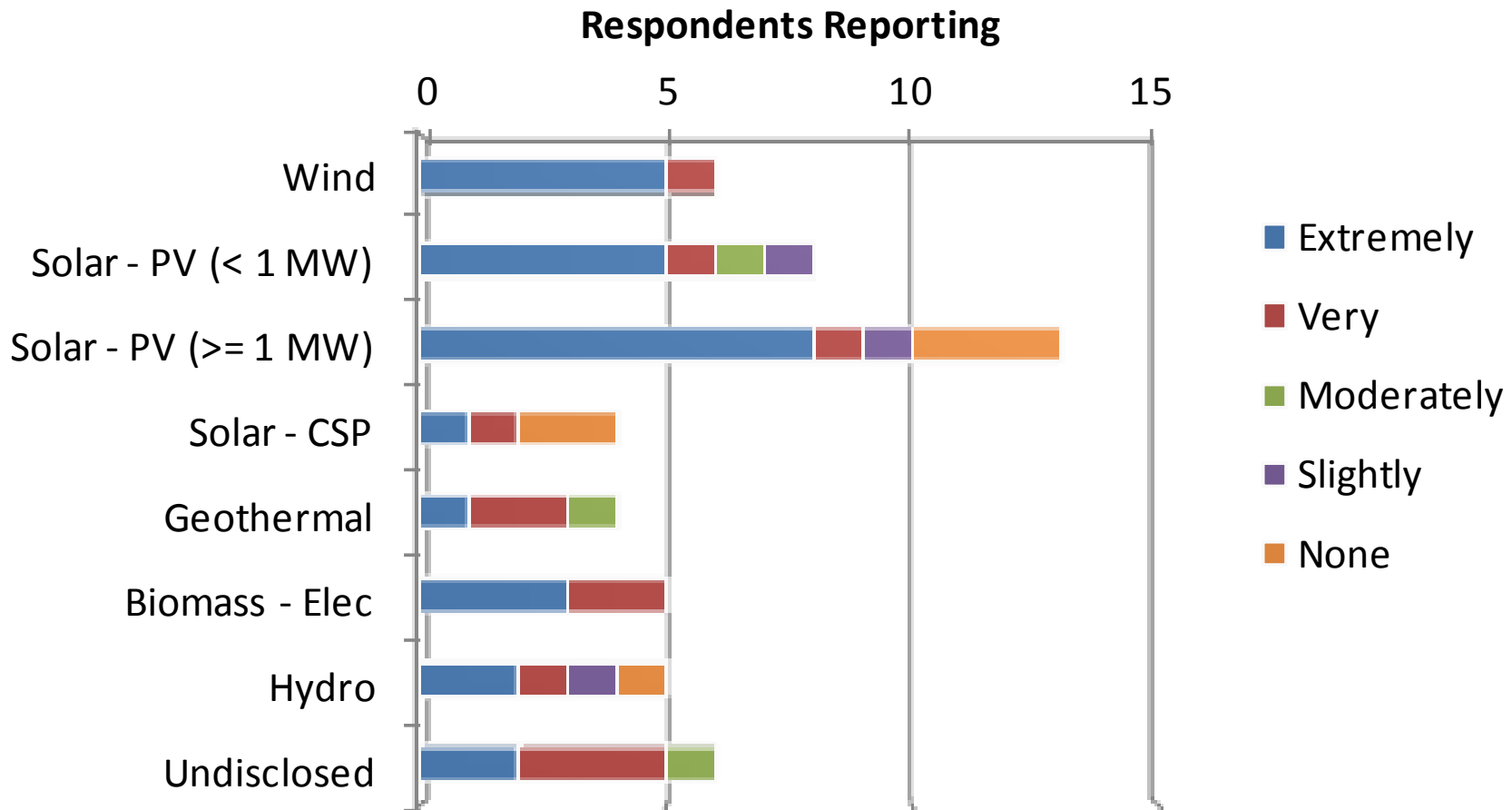
Primary Technology

Importance of PPA Agreements 1H'11



Long-term agreements are imperative for biomass-electric, and extremely important for wind, large scale solar, geothermal, and hydro.

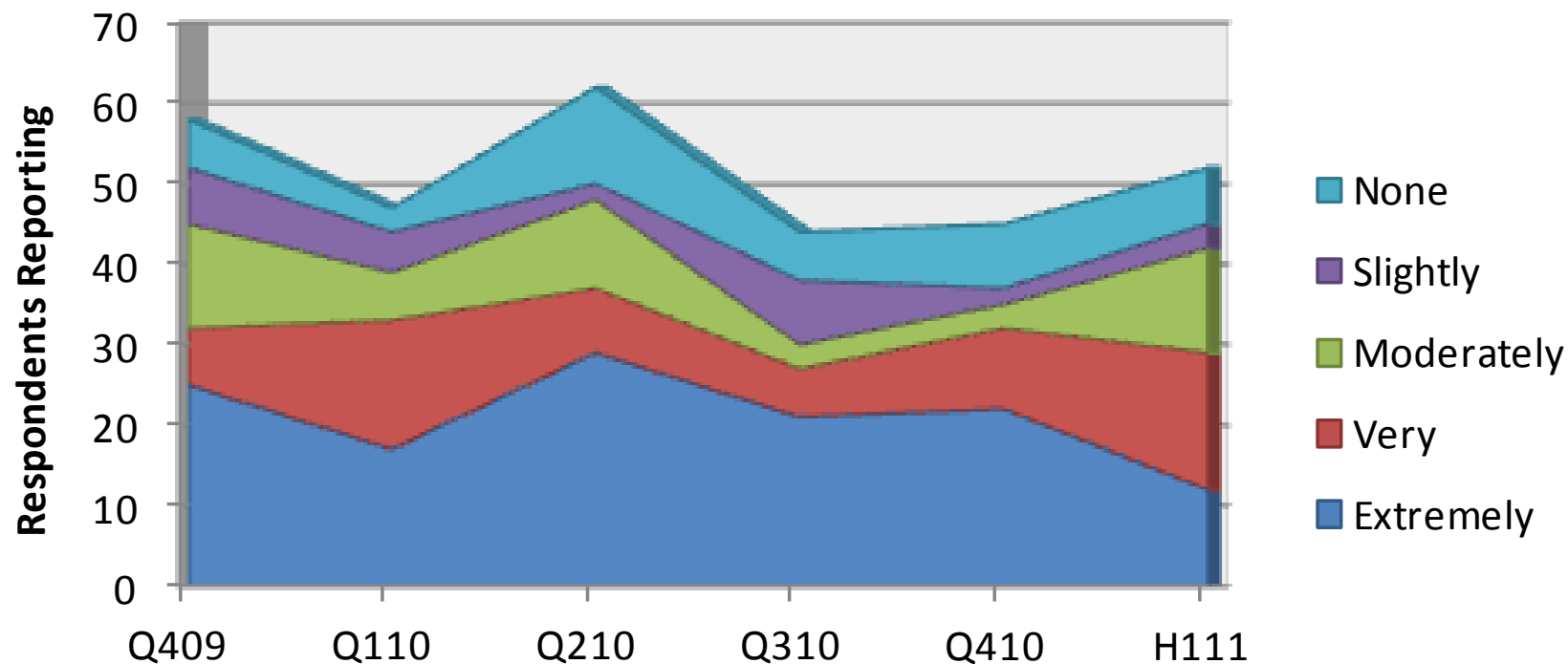
Importance of Federal Incentives 1H'11



Federal incentives are imperative for wind, 60% indicated extremely important for solar and biomass.

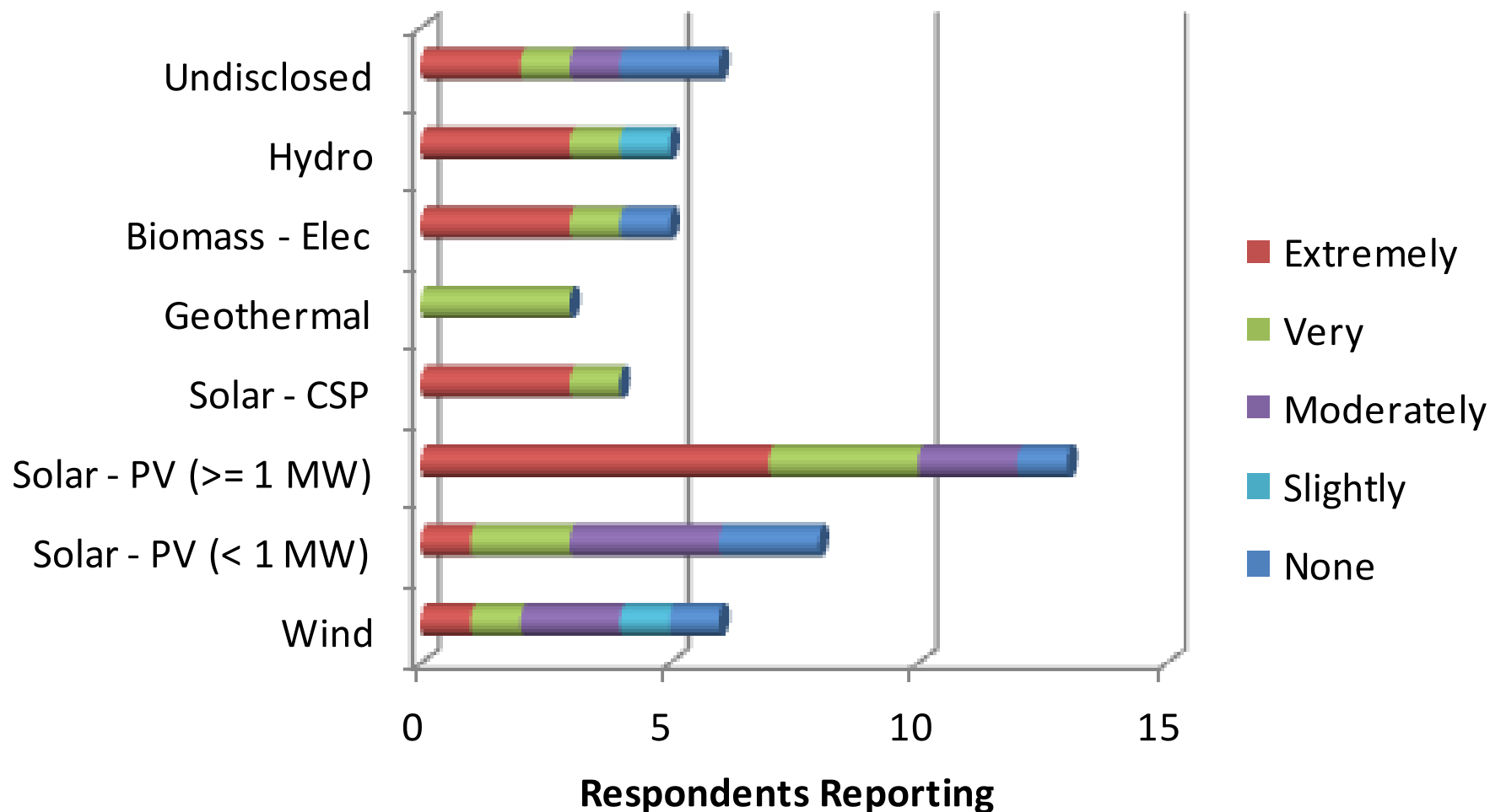
Importance of State Incentives

Trend - All Technologies



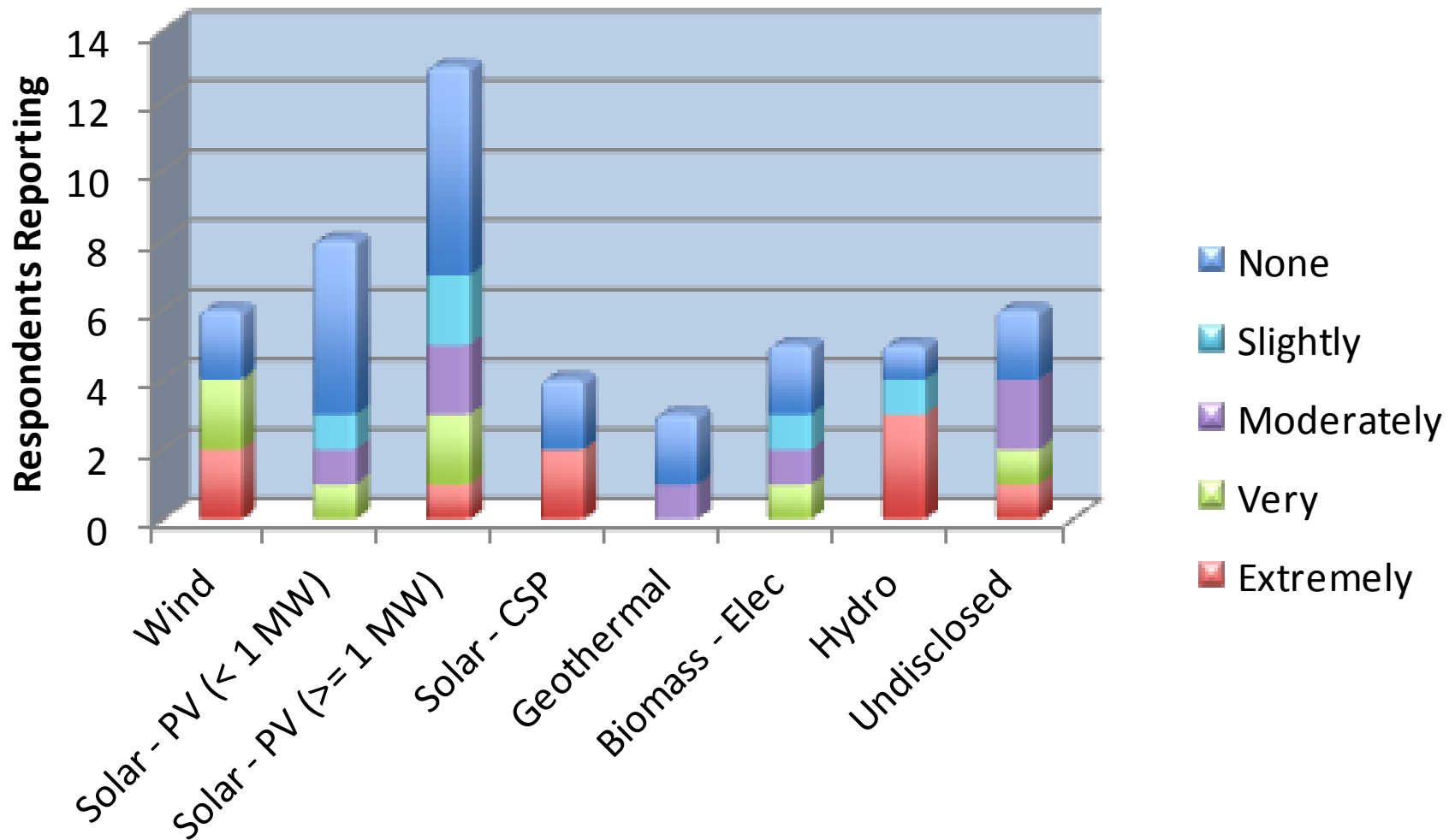
State incentives show declining trend in importance.

Importance of External Financing 1H'11



External financing is extremely or very important for most technologies. Wind surprisingly varied in answers, could indicate the projects are better capitalized.

Importance of Loan Guarantee 1H'11



Loan guarantee is considered extremely important for large-scale projects - wind, solar CSP, hydro.

REFTI Questionnaire: Q10

10. What was the *largest* barrier to project development and how did it impact the project(s)?

Barrier

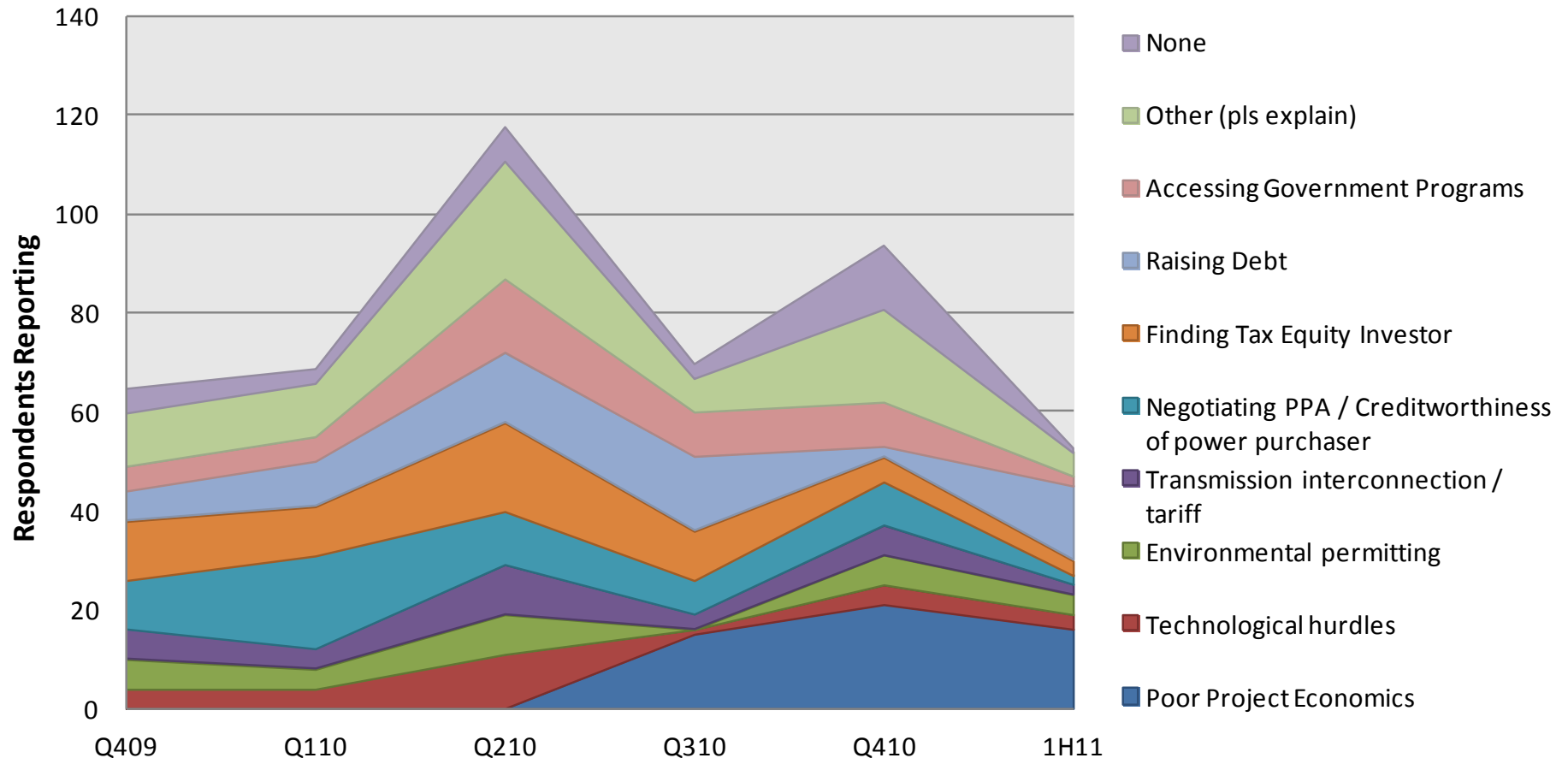
Impact

Primary Technology

Comments Related to Barriers and Impact?

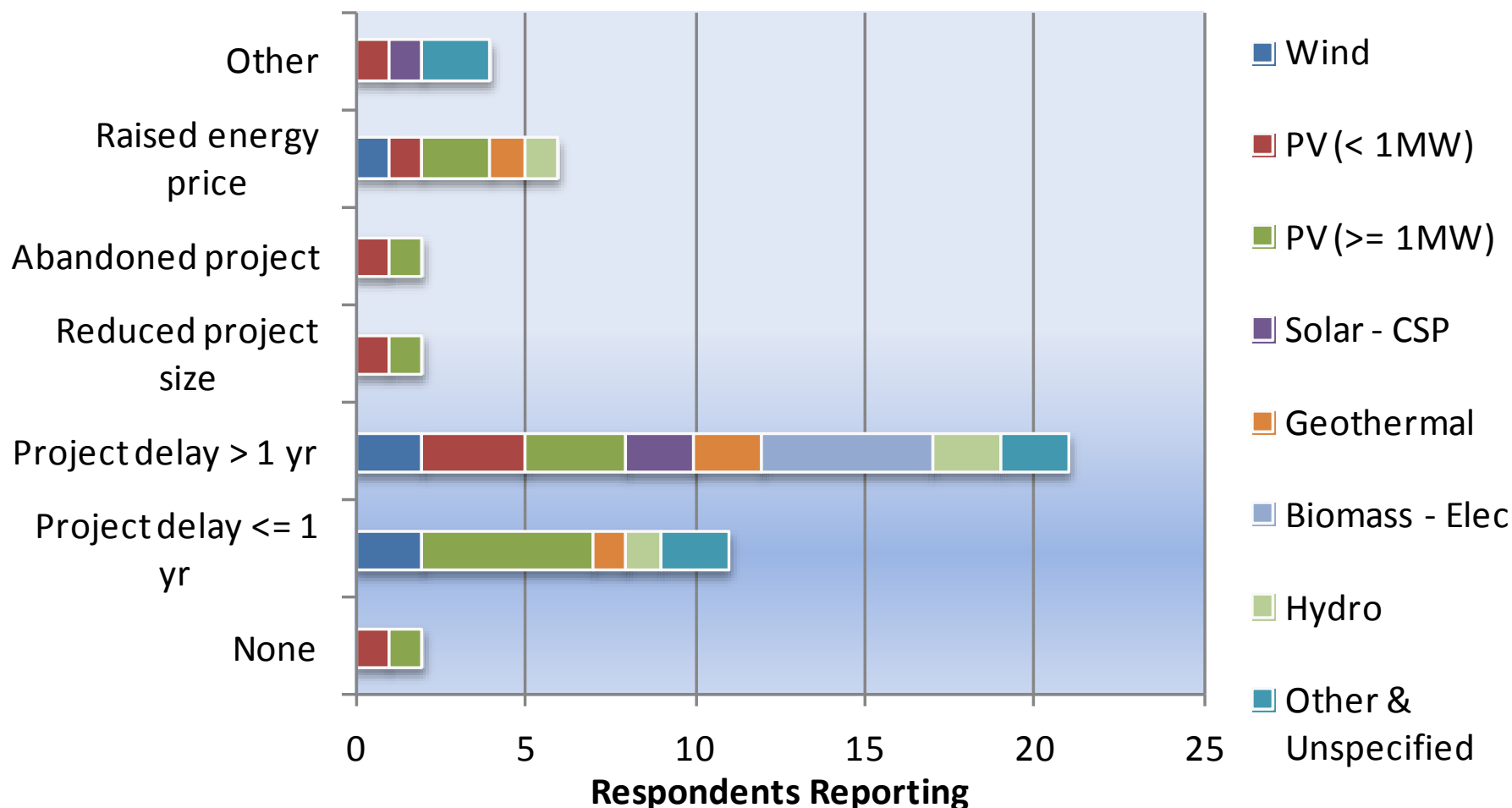
Largest Barriers to Development - Trend

All Technologies



Poor project economics showing increasing barrier to project development. Accessing government programs, finding tax equity, negotiating PPA less of an issue over time

Consequences of Dev. Barriers – 1H'11



Long-term project delay is the most common consequence of development barriers.

REFTI Questionnaire: Q11

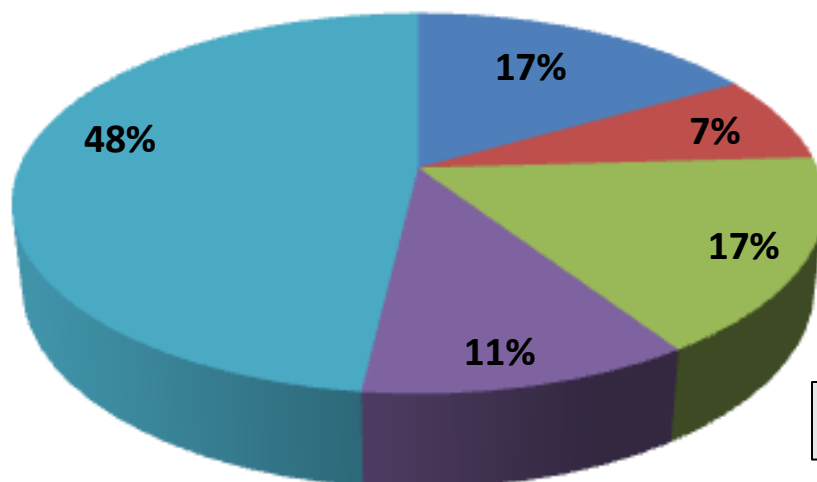
11. Will termination of the 1603 Treasury Grant cause tax equity yields to increase?

- ☐ Yes, by small amount (< 100 basis points)
- ☐ Yes, by medium amount (100 - 200 basis points)
- ☐ Yes, by large amount (> 200 basis points)
- ☐ No
- ☐ Not sure

REFTI Questionnaire: Bonus Question

**Will termination of the 1603 Treasury Grant
cause tax equity yields to increase?**

- Yes, by small amount (< 100 basis points)
- Yes, by medium amount (100 - 200 basis points)
- Yes, by large amount (> 200 basis points)
- No
- Not Sure



54 respondents

A lot of uncertainty over impact of 1603 termination – most respondents indicated “not sure” of impact. Only 11% said no impact

THANK YOU

REFTI results and presentations available at:

<http://financere.nrel.gov/finance/REFTI>

REFTI 2H 2011 coming out Jan/Feb 2012

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